

AN EXPERIMENTAL STUDY OF A METHOD FOR IMPROVING THE EFFECTIVENESS
OF THE NOMINAL GROUP TECHNIQUE

BY

JOHN J. SULLIVAN

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By

John J. Sullivan

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The Nominal Group Technique (NGT) was developed as an alternative group decision technique to other group methods such as the Interactive, Brainstorming, and Delphi techniques. Although several past studies have shown the NGT to be superior to other group methods, it was hypothesized that the NGT could be improved. Specifically, this study examines two aspects of the NGT. The first is a modification to the NGT process (Mod NGT) in which the verbalization of ideas is replaced by an anonymous written system utilizing 3 x 5 cards in an attempt to avoid the "linking" of ideas with individuals. A second factor considered was whether the performance of the NGT is affected by whether the Nominal Group question addresses an issue that is relatively sensitive (or nonsensitive) to the participants.

The NGT question was a problem solution task involving possible ways of improving the Army ROTC program. The research design was a completely randomized field experiment using experimental and control

groups. One hundred and forty-four Army ROTC cadets were randomly assigned to 24, 6 member, ad hoc groups. Dependent measures were the perceived level of group satisfaction, the number of ideas withheld from the group, the quantity of ideas produced, and a consensual judgement rating of the "top-seven" ideas generated. Interval data (number of ideas withheld and the quantity of ideas) were analyzed using Univariate ANOVA while ordinal data (satisfaction and consensual judgement rating) were analyzed using the Kruskal-Wallis Nonparametric ANOVA.

The overall conclusions were that the Mod NGT groups tended to outperform the control ^{groups} gropus (using the Delbecq NGT) in all cases, whether a sensitive or nonsensitive question was used. It was also concluded that the Delbecq NGT (control groups) tended to perform best using a nonsensitive, rather than a sensitive question.

Most groups, to some extent, withheld a portion of their ideas from presentation. The Mod NGT groups outperformed the Delbecq NGT groups by a three to one margin, with the latter withholding an average of more than nine ideas per group.

I. INTRODUCTION TO THE STUDY

Group decision making is becoming increasingly common in modern organizations. Tillman (1960) found that 94 percent of firms with more than 10,000 employees and 64 percent with less than 250 employees utilized formal committees. Van de Ven (1974) cites numerous studies which have concluded that executives spend an average time of between 25 and 80 percent of their time in committee or group meetings. He also notes, "A characteristic concern of contemporary administrators is to find viable methods for making decisions where a number of people, differentiated in backgrounds and perspectives, need to be involved in the problem solving process" (p. 1). One such technique for group decision making is the Delbecq et al. (1975) Nominal Group Technique (NGT, See Appendix A for a detailed description).

The NGT, however, is not the only technique for group decision making. In fact it is a relatively new method that has only recently been utilized to try to solve some of the "problems" inherent in the most widely accepted method of group decision making, the "Interactive Method." Basically the interactive method is defined as a group meeting in which all communication acts take place between members with minimal controls or formal structuring (Delbecq, 1968). The process of decision making in the interacting group is (1) unstructured group discussion for obtaining and pooling ideas of the participants and (2) majority voting on priorities by hand count (Van de Ven, 1974).

Most operating managers are all too aware of some of the difficulties that arise from the use, or over use of interactive group meetings. Many meetings fail to resolve problems and participants often become frustrated because these meetings can be dominated by power groups, they can get bogged down with argumentation and they seldom leave room for creative thinking and suggestions. Dunnette et al. (1963) and Campbell (1968) showed that they can be restrictive and dysfunctional for many types of problem solving. Gustafson et al. (1973, p. 282) cite many reasons why interactive groups can be restrictive including:

1. A central tendency effect where groups tend to pursue a limited train of thought (Taylor et al., 1958; Dunnette et al., 1963).
2. The self weighting effect where the individual will participate or seek to exercise influence to the extent that he feels equally competent with others (Kelly & Thibaut, 1954; Collaros and Anderson, 1969).
3. The hidden agenda effect, where covert judgements are made but not expressed (Collaros & Anderson, 1969).
4. Group Pressures for Conformity and the implied threats of sanctions from the more knowledgeable members (Dalkey & Hilmer, 1963; Hoffman, 1965).
5. The influence of dominant personalities (Dalkey and Hilmer, 1963).
6. The amount of time and effort spent by the group to maintain itself (Dalkey & Hilmer, 1963; Dunnette, 1964); and
7. A tendency to reach "speedy decisions" before all problem dimensions have been considered (Maier & Hoffman, 1960).

A complete review of the potential problems associated with interacting groups is outside the scope of this dissertation. Van de Ven and Delbecq (1971) provide an excellent review of these problems.

As researchers and theorists became aware of the widespread use of committees and the problems associated with interactive groups, alternative forms were proposed. One of the first was "Brainstorming"

(Osborne, 1963). Brainstorming is a relatively unstructured group process which is designed to "free individuals from inhibition, self-criticism, and criticism from others in order that, in response to a specified problem, they may produce as many different ideas as possible" (Taylor et al., 1958, p. 24). Although Brainstorming showed promise, several studies (Bouchard, 1969; Dunnette et al., 1963 and Taylor et al., 1958) have demonstrated that group participation during brainstorming inhibits creative thinking. Another difficulty with the process is there is no evaluation, voting, or ranking phase so individuals can leave the meeting without a sense of closure.

Another alternative to the interactive group is the Delphi technique, which was developed by Norman Dalkey of the Rand Corporation. The Delphi technique is designed to systematically solicit and collate the judgements of many geographically separated individuals on a specific topic. It utilizes a carefully designed set of questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses. The Delphi technique does solve some of the problems with the interactive technique but since one topic can take as much as five months to complete, its usefulness is somewhat limited. In addition, it does not provide the productive stimulation of positive face-to-face interaction.

The most recently developed alternative method, the Nominal Group Technique, was developed by Andre Delbecq and Andrew Van de Ven in 1968 as one way to avoid the many problems associated with interactive groups. In the truest sense, the use of the term "Nominal" is not totally accurate in the context of the Delbecq et al. (1975) NGT

(hereafter called the Delbecq NGT, the Delbecq Technique or the NGT). Nominal groups are usually so designated because they are groups "in name only" as verbal exchange, a requirement for group behavior, is excluded (Delbecq et al., 1975). The Delbecq NGT-does include some provisions for interaction among group members but arguments and lengthy discussions, so common in most interactive meetings, are specifically prohibited.

The NGT is a special purpose technique that is useful in situations where individual judgements must be tapped and combined to arrive at decisions which cannot be calculated by one person. It is a problem solving or an idea generation technique and it is not designed for routine meetings, coordination, bargaining or negotiations (Delbecq et al., 1975). Possible suggested uses, other than traditional group decision making, include: as a training tool (Green, 1974); as an organizational development intervention technique (Mosley & Green, 1974); to improve upward communications (Green & Pietri, 1974); as a way of identifying critical health problems (Delbecq et al., 1972); as a pilot research technique (Van de Ven & Delbecq, 1972); and as part of the program planning process (Delbecq & Van de Ven, 1971).

The NGT is designed to facilitate creative decision making where heterogeneous group members must pool their judgements to invent or discover a satisfactory course of action. Thus a critical requirement for effective leadership is to ensure that judgemental decisions are facilitated by judgemental techniques.

The NGT is a structured group meeting which proceeds according to the following general format:

1. Silent generation of ideas by the participants in writing (a form of silent brainstorming).
2. Round Robin feedback from participants of tersely worded ideas on a flip chart.
3. Serial discussion of each idea for clarification and individual evaluation only.
4. Secret voting by participants to rank order the ideas.
5. (Optional) discussion of vote and final voting.

The NGT is designed to reduce or eliminate some of the inhibiting factors (as previously cited) that are inherent in interacting groups. Cooley (1977, p. 30-32) cites a number of process characteristics that enhance the effectiveness of the NGT. They include:

1. Stimulate "creative tension" by means of the presence of others, the silence, and the evidence of activity. This tension is important for individual commitment to the search process. Thus the social facilitation of the group setting is retained and amplified (Van de Ven and Delbecq, 1974).
2. Avoid evaluation or elaborating comments while problem dimensions are being generated (Maier & Hoffman, 1960).
3. Provide each individual time and opportunity to engage in reflection (search) and force participants to record their thoughts (Dunnette, 1964; Horowitz & Newman, 1964; Maier and Solem, 1952).
4. Avoid the dominance of group output by strong personality types (Maier & Maier, 1957).
5. Prevent premature closure to the alternative search process and decision making (Bennette, 1955; Maier & Hoffman, 1960).
6. Allow all participants to share in the opportunity for influencing the direction of group decision outcome (Goldman et al., 1961; Pelz, 1956).
7. Encourage the generation of minority opinions and ideas which consequently are more likely to be voiced (Maier & Solem, 1952; Shukla, 1970).
8. Tolerate conflicting, incompatible ideas since all ideas are revealed in writing (Deutsch, 1949; Guetzkow & Gyr, 1954; Vroom et al., 1969).
9. Alleviate "hidden agendas" or covert political group dynamics which are difficult to develop when writing (Fourezos et al., 1950).

10. Induce a sense of responsibility in the members for achieving group success (Benne & Sheats, 1948).
11. Impose a burden upon all participants to work and produce their share of the necessary tasks (Bales, 1953; Duetsch, 1949).
12. By means of written expression, induce a greater feeling of commitment and a greater sense of permanence (Bouchard, 1969; Horowitz & Newman, 1964).

Mosely and Green (1974) succinctly summarized the advantages of the Nominal Group Technique by noting it was faster, less expensive, and involved more people in a shorter time frame than most interactive meetings.

Despite these process advantages, there are some restrictions associated with the NGT. They include:

1. Extended preparation for the NGT meeting is usually necessary to identify the information desired from a group and to provide the necessary supplies.
2. Inflexibility of the structured NGT format makes it difficult to make adjustments or to change topics in the middle of a meeting; therefore, NGT is generally limited to a single purpose, single topic meeting. There are some situations however, (e.g., Program Planning, and Budget and Proposal Review) where a series of related topics can be discussed using the NGT format.
3. Conformity behavior to a structured format is required on the part of all participants, a condition which is not immediately comfortable to inexperienced participants.

A survey of recent research has revealed a great deal of evidence that supports the conclusion that the NGT is more effective than the more traditional Interactive method. Several authors have, however, cited instances where the NGT has proven to be no more effective than its traditional counterpart and still others have suggested some modifications to the technique which might improve its effectiveness. The most relevant empirical studies are discussed in the next chapter.

II. REVIEW OF RELEVANT EMPIRICAL STUDIES

A review of the literature was undertaken to examine studies that appeared to attack issues that were relevant to this project. The questions addressed and sometimes answered in these works provided additional hypotheses and motivation for the experimental research undertaken in this study.

1. Chung and Ferris (1971) compared the Nominal Group Technique with the Interactive Group method. Twelve graduate students completed a written case analysis and the authors concluded that the NGT was superior to the Interactive method and that the NGT can reduce inhibitions and improve the quality of the group's decision.

2. Gustafson et al. (1973) evaluated four methods of eliciting Bayesian subjective likelihood ratio estimates. The authors compared the performances of individuals, Interacting groups, Delphi groups and Nominal groups (NGT). Subjects were 288 freshmen at the University of Wisconsin, and were evenly divided into 72 groups, each with four members. Eighteen of the groups were randomly assigned to each of the four treatments. An "approximation" of the NGT was utilized which followed an estimation-talk-estimation format and an "open discussion" was allowed during the "talk" phase. Even though this "open discussion" is a violation of the prescribed NGT format of Delbecq et al. (1975), the authors still concluded the nominal process (as modified) was superior to all others in this judgment task.

3. Van de Ven and Delbecq (1974) compared the effectiveness of Nominal (NGT), Delphi and Interacting groups. Student dormitory

counselors were assigned to 60 heterogeneous groups of 7 members each using a "stratified random sampling" procedure. The task was defining the job activities for student dormitory counselors. The authors concluded that (1) both the NGT and the Delphi technique were clearly superior to Interacting groups, and (2) NGT groups generated more items and expressed greater group satisfaction than either the Delphi or Interacting groups. The Delbecq NGT format was followed in this study.

4. Green (1975) examined the hypothesis that Nominal groups were superior to Interacting groups for problem identification tasks regardless of the leadership style employed in the Interacting groups (Permissive, Democratic or Authoritarian). The study used 70 Electronic Data Processing (E.D.P.) student volunteers. Subjects did not know each other well and were randomly assigned to fourteen, five member groups. The task was "In your EDP course, what problems have you noted?" The authors utilized a three step (Listing, Recording, Voting) NGT process. The Serial Discussion for Clarification phase (Phase three) of the Delbecq et al. (1975) NGT procedure was omitted from this study. The authors concluded there were no significant differences between the Nominal and Interacting groups in either the quantity or quality of ideas generated. The variation in the NGT format by Green (1975) discounts this study as a true test of the Delbecq NGT format.

5. Carr (1975), as cited by Cooley (1977) compared Nominal, Interacting and Brainstorming groups with the pooled output of individuals working alone. Seventy-two college students were divided into twelve groups and were asked to suggest solutions to assigned problems. Carr concluded that pooled individual work was superior to each of the three groups methods. He further noted Nominal groups produced more ideas

than Interacting groups and identified more difficult problems than Brainstorming groups. Performance was compared on the basis of quantity and quality of ideas. Cooley presented no data on which NGT format was utilized.

6. Frederick (1976) compared Nominal and Interacting groups on a problem analysis task. Undergraduate management students were randomly assigned to twenty groups with seven members each. The group task was to indicate any barriers that might prevent the group from attaining a stated goal. Frederick concluded (1) nominal groups did not produce a greater quantity or greater number of high quality ideas, (2) the nominal groups did produce ideas of a higher average quality than Interacting groups, and (3) nominal groups produced a greater number of high satisfaction and a smaller number of low satisfaction individuals than did the interacting groups. No information was provided on which NGT format was utilized.

7. Nemiroff et al. (1976) compared the performance of Nominal, Consensual and Interacting groups. Consensual groups are defined as groups employing the technique whereby each member must agree upon each issue or idea. Undergraduate management student volunteers were split into forty-eight, four member groups. The task was a "Lost at Sea" problem with an objective solution. A modified Nominal process was utilized. After the listing phase, the round robin provided that each participant must present all of his rankings at one time and then give a five minute rationale for his selections. After the five minute rationale, the next participant listed his rankings and so on until each member had spoken. There was then an "open discussion"

phase and a final voting. A recorder is not assigned to each group. The authors concluded that (1) consensual, (modified) Nominal and Interacting groups ranked one, two, three on decision quality, (2) there were no significant differences in satisfaction levels between the three treatments and (3) the modified NGT consumed significantly less time in reaching a decision than the other two methods.

8. Stead (1976) compared the performance of Nominal and Sequential Brainstorming groups. Sequential Brainstorming is a structured group technique that utilizes a round robin format for presenting ideas. Eighty-eight state employees were divided into sixteen groups whose sizes ranged from four to seven persons. The task was "How can communications be improved between state staff, parish directors and area consultants?" The authors concluded that the Nominal groups generated a higher quality of ideas but the Brainstorming groups were superior in terms of the quantity of ideas and group satisfaction. A description of the NGT format was not provided in this description of the study.

9. Nutt (1976) compared the following three processes:

- A. Systems--first objectives were developed using the Interactive method and then the NGT was used to identify ways of providing services to meet those objectives.
- B. Behavioral--the NGT was used both to identify client problems and also to identify solutions to those problems.
- C. Heuristic--The Interactive technique was used to identify solutions.

The Systems (combination Interactive and NGT), the Behavioral (NGT) and the Heuristic (Interactive) models were compared in four field settings. Performance was measured by quality, satisfaction and number of new ideas. Nutt concluded that the Behavioral approach is most effective when new ideas (innovation) are required while the Systems approach is best for situations that demand high quality decisions. The Heuristic technique was found to be ineffective. The author does not provide a sufficient description of the NGT format to be able to ascertain if the Delbecq NGT format was followed.

10. Burton et al. (1977a) measured the effects of group size on performance in Nominal groups. Two hundred forty-eight volunteer college students were split into groups ranging from five to seventeen members. Using a highly structured task, group performance was compared using three criteria: quantity, quality, and perceived satisfaction. They used a (modified) three step NGT similar to that used by Green (1975) (listing, round robin, and voting). The Serial Discussion for Clarification (Phase 3) of the Delbecq et al. (1975) NGT format was omitted. The authors concluded that (1) the optimal NGT size is "around 10"; (2) beyond a size of ten, the number of unique ideas continues to increase but group satisfaction decreases.

11. White et al. (1977) compared the performance of NGT, Brainstorming and Interactive groups in a field setting. Ninety subjects were divided into groups of six. The task was "What significant personal and/or organizational factors (or changes) must be taken into account in connection with a hospital expansion program?" Performance was measured by the quantity of ideas generated. They concluded that there were no significant differences in performance between Nominal and

Brainstorming groups, but both were superior to Interacting groups. The use of a single dependent measure in this study may not provide sufficient data to adequately judge the true performance of the Nominal groups as the generation of a large number of ideas is not the sole purpose of the NGT.

12. Burton et al. (1977b) suggest a modification to the NGT, the addition of the Gordon technique. The Gordon technique is a method of hiding the real problem under discussion from the participants on the theory that if they know the actual problem, they will be too "close to it" to analyze it accurately. Rather than being told the real problem (What company problems limit organizational effectiveness?), participants were asked to "list the subject areas you would like to have included in a follow-on training program." Subjects were thirty Management personnel in a company Management Development program. Of the thirty-three ideas generated, only seven were perceived as actually being "training problems" while the other twenty-six were determined to be problems that prevented organizational effectiveness. The five step NGT procedure (listing, round robin, voting, serial discussion and final voting) varied from the Delbecq et al. (1975) NGT procedure in that the serial discussion followed the initial voting phase rather than preceding it. The authors conclude the NGT/Gordon combination is more effective than Brainstorming or the traditional NGT. As no control group was provided for comparison purposes, and since a modified NGT was utilized, the conclusions of the authors must be seriously questioned.

13. Cooley (1977) conducted one of the most ambitious studies on the NGT to date. He attempted (1) to determine the optimal group size (5, 6, 7, 8, 9 or 10 members) for NGT groups, (2) to test a modification to the Delbecq (1975) NGT and (3) to determine the appropriate method for judging the quality of group decisions. Five hundred and forty Air Force officers were used as subjects. The task is one of problem identification, using a USAF Base Resource Management Exercise.

The N_1 Control group uses a variation to the Delbecq et al. (1975) NGT method. During the round robin phase, (1) participants must read their items in the same order they are written on their listing sheet; (2) after each item is recorded, the leader asks "Does anyone need clarification?" If so, only the reader is allowed to clarify; and (3) after each item is recorded, the leader asks "Does anyone else have the item listed?" If so, the participant raises his/her hand, a check is put by the item on the wall, and the participant does not read that item when his/her turn comes. After the completion of the round robin, there is no serial discussion for clarification phase and voting begins immediately.

The N_2 Experimental group uses a further modification of the NGT format. After a seven minute (as opposed to ten in N_1) listing phase, round robin recording begins. During this phase free discussion (as opposed to only clarification in N_1) is allowed. After this first round robin, a second three minute listing phase begins. Next, there is a second round robin phase with free discussion (as compared to no discussion in N_1). After the second round robin, the N_2 NGT process follows the same procedures as the N_1 groups. Withholding was measured

by comparing the individual listing sheets of each member with the ideas listed on the group's flip charts.

Cooley concluded from his study (1) there were no significant differences in the performance between N_1 and N_2 NGT groups. (2) A NGT group size of ten was the optimal group size. (3) "Priority" of items, as judged by a panel, is the best quality criteria for ideas. However, he further noted on this priority rating that, "average quality need not be evaluated for tasks similar to the one used in this study" (p. 219). (4) Both N_1 and N_2 groups "withheld" ideas from the recorder. In fact, each of the seventy-two groups had ideas withheld and in some as many as 33 percent of the listed ideas were withheld from the group. Despite Cooley's findings that the average quality and the quantity of ideas were closely correlated, until a definite relationship is established, it would seem that the continual use of some dependent measure of quality would be suggested as one method of judging the performance of nominal groups.

III. STATEMENT OF THE PROBLEM AND OBJECTIVES OF THIS STUDY

Most authors have hypothesized that the Nominal Group Technique would be more effective than the traditional Interacting Group process. Ten of the thirteen studies cited in the previous chapter compared the NGT with the Interactive process. Of the ten studies, eight concluded that the NGT was superior to the Interactive method. One found partial support for the superiority of the NGT, while only one found no significant difference between the NGT and the Interactive process.

Perhaps an even more significant finding was the fact that 75 percent of the studies that described their technique used a Nominal group process that varied significantly from the method prescribed by Delbecq et al. (1975). Six of the nine studies that described the technique used a somewhat modified NGT (2, 4, 7, 10, 12, 13). None of the six authors appeared to be aware of the potential effects of their modifications and several stated they were following the Delbecq et al. (1975) technique although the narrative descriptions in their methodology sections outlined a process that varied significantly from the published work of Delbecq. Of the thirteen studies, only two authors intentionally tested modifications to the Delbecq technique (12 and 13). One (13) utilized a control group which did not follow the Delbecq NGT format and the other (12) failed to use a control group at all.

In summary, the review of the literature leads to two basic conclusions. (1) The Nominal Group Technique has proven itself to be

a more effective decision making process than the Interactive method for certain types of tasks. (2) A large number of modifications to the Delbecq et al. (1975) NGT have been used in research settings (whether intentionally or not) but there have been relatively few attempts to test experimentally whether these modifications increase or decrease the effectiveness of the NFT.

The Delbecq NGT has now been in use for a full decade. Although it has proven to be a successful tool, it is hypothesized that further refinement is possible. The primary question then becomes which aspects are most likely to lend themselves to improvement?

It is hypothesized that one question worthy of study is whether inhibitions about contributing ideas among participants can be reduced or eliminated from the NGT process? This is based on the assumption that there are inhibiting factors working on participants during an NGT meeting. Even though the technique was primarily designed to eliminate inhibiting factors that are present during interactive group meetings.

The review of the literature revealed only one study that provided evidence of inhibiting factors. Cooley (1977) found that every group (a total of seventy-two) in his experimental design withheld ideas during the NGT process. He further noted that some groups withheld an average of 33 percent of their ideas from the recorder.

Unfortunately the Cooley study used a modified version of the NGT (see number 13 in the Review of Relevant Empirical Studies Chapter) which might tend to increase inhibitions beyond the level that might be found if the traditional NGT were utilized. More specifically,

Cooley required each participant to clarify his/her own ideas. Such a procedure encourages the linking of ideas with people and if that occurs individuals may be reluctant to present ideas that they may have difficulty in clarifying. Such a procedure could drastically increase the number of ideas that were "withheld" from the group. If withholding could be clearly demonstrated in groups carefully adhering to the Delbecq NGT format, this would support the hypothesis that the NGT contains some inhibiting factors. Thus, one variable considered in this study was the degree to which NGT groups withheld ideas.

Possible Sources of Participant Inhibitions in the Delbecq NGT

Some portions of the NGT appear, a priori, to have the potential for inhibiting participants. Specifically during the round robin phase (Phase 3) of the Delbecq et al. (1975) technique there are some procedures that could be inhibiting. They include:

1. Reading Aloud--During the round robin phase each participant is required to read each of his/her ideas to the recorder. The author hypothesizes that by requiring each individual to read each of his ideas to the group, inhibitions are raised unnecessarily. It is suggested that by requiring a shy or low status person to read each idea he/she might be discouraged from submitting ideas. Individuals who have difficulty reading aloud might be reluctant to submit ideas or be encouraged to "pass" as an avoidance technique to escape the possibility of stammering, stuttering or mispronouncing a word.

2. "Attaching" an idea to an individual--The NGT is designed to separate ideas from the individuals presenting them. However, when a person reads an idea, there is always the possibility the group will remember which individual presented it. (This is especially true for the first items on the flip chart list as they can easily be linked to the presenter by following the seating order of the participants.) Thus a shy or low status individual might not present an idea because of this fear of embarrassment. Similarly, ideas that are assumed to be of general knowledge or that might be near duplicates of ideas already presented may be withheld for the same reason. Ideas that are complex in nature might also be withheld by individuals who are apprehensive about possibly having to explain them to the group. Another possibility is that controversial or negative ideas may be withheld because of the possibility that the "boss" may remember or find out who presented it.
3. "Passing" and "Nonpassing" during the round robin phase--During the round robin phase individuals who have no ideas to present may pass each round if they wish. A potentially inhibiting aspect of the "pass" procedure could occur during the late rounds of the round robin phase. There might be a tendency for premature closure in that with almost everyone passing, an individual with ideas still remaining might also pass to avoid standing out or appearing as a "know-it all." This fear of "standing out" by creative

individuals could force the round robin to end before all the possible ideas are presented.

"Nonpassing" could occur because individuals who "pass" during several consecutive rounds risk the possibility of being identified as "noncreative." This fear could cause individuals to add trivial ideas to avoid having to "pass" and thus slow up the group process. This fear could also force participants to present ideas that are not completely thought out (or ones that could be condensed) that realistically should be withheld until they are refined and presented in a later round.

4. Clarification--After the round robin phase is completed, a serial classification phase begins. During this phase of NGT, participants are allowed to present their evaluation of each idea or request clarification of an item. There may be a tendency on the part of the recorder and/or the group to ask the presenter of an item to "clarify" his/her idea. The presenter of an item can be identified because the group usually remembers who read the idea aloud during the Round Robin phase.

This "identification" is counter-productive in that it forces an individual to defend his/her idea. The NGT is designed to decrease this "identification" but in practice it can still occur. Participants might also be discouraged from presenting negative evaluations (or

conversely be encouraged to give excessive positive evaluations) if the idea came from a high status individual.

The potential inhibitions or problems cited above could lead to a reduction in the effectiveness of the NGT. Although there is little experimental evidence to support the existence of these inhibiting factors, casual field observations supported the a priori hypothesis that they do in fact exist, and that a modification of the Delbecq NGT might lead to an improvement in its effectiveness.

Mod NGT

The first objective of this study was to experimentally test the hypothesis that modifications to the silent writing and round robin phases of the Delbecq NGT (hereafter called Mod NGT) would improve the effectiveness of groups using the procedure. Mod NGT alters the Delbecq NGT in the following ways:

1. During the silent writing phase (Phase 1) each participant is given a stack of blank 3 x 5 cards along with a sheet describing the problem to be considered. Each member writes each of his/her ideas on a separate 3 x 5 card (rather than on a listing sheet, which is the procedure using the traditional NGT). The silent writing phase lasts ten minutes. All participants were asked to use pencils to ensure anonymity.
2. Mod NGT changes the Round Robin phase in that the reading of ideas by individuals is eliminated. Instead,

during each round, each participant places one 3 x 5 card (folded) in a hopper (hat or open box) that is passed around the table.

After each person has placed one card in the hopper, the recorder reads each idea aloud and records it on a flip chart. By having the idea written rather than read aloud (as occurs using the Delbecq NGT), there should be less likelihood that a recorder would be tempted to record an idea using his own terminology rather than the exact wording of the group member.

If any ideas are unclear or are too long, the recorder reads it aloud again and asks that the idea be clarified and/or shortened and resubmitted during some future round. If during any round a participant wishes to "pass," he/she hands in a blank 3 x 5 card rather than one with an idea on it. The round robin continues until two rounds have passed in which all the cards in the hopper were blank. All the remaining phases of the NGT proceed according to the Delbecq technique.

It was hypothesized that using the 3 x 5 cards, rather than reading one's ideas aloud, would significantly reduce the potential inhibiting factors that might occur while using the Delbecq NGT.

NGT Groups Using Sensitive Vs. Nonsensitive Questions

Delbecq et al. (1975) assume that the nature of the task has no effect on the effectiveness of the Nominal Group Technique. However, studies by Janis and Mann (1976), Shaw (1971) and Festinger and Aronson (1960) have suggested that the type of task can affect the outcome of a group decision process.

More specifically, the author hypothesized that the degree to which the NGT question might be regarded as "sensitive" by the group members might have some impact on the NGT groups effectiveness. The author suggests that "sensitive" questions would raise the inhibitions of the group members. Inhibited members in turn would tend to be less candid, with the final result being a less effective group.

Inhibitions could be raised by a sensitive question in Nominal Groups during the listing phase where participants could fear their ideas might be "traced" back to them and thus their ideas, concerns and prejudices would be known to all. Sensitive questions could also raise inhibitions during the discussion phase where one might be reluctant to express an opinion that might diverge from the group's thinking because of fear or just to avoid "making waves."

Thus the second hypothesis considered in this study was whether the sensitivity of the NGT question has any effect on the NGT group's output. In order to test this hypothesis two separate NGT questions were generated for the study. The sensitive question related to the internal policies and procedures of the local AROTC unit thus raising the possible inhibiting factors of criticizing local policy, personnel and procedures. A second, nonsensitive question, related to how the

AROTC program could be changed to make it more attractive to potential cadets. This second question related less to those already in the program and thus was designed to raise fewer inhibitions than the sensitive question.

It was suggested above that the Mod NGT would reduce any inhibiting factors that might still be present in the Delbecq NGT process. If the Mod NGT does, in fact, reduce inhibitions, one would expect it to perform much better than the Delbecq NGT (control) on sensitive questions when inhibitions are high.

It was also hypothesized that even generally nonsensitive questions raise some inhibitions and as a result the Mod NGT should still outperform the Delbecq NGT when both used nonsensitive questions, but perhaps not as much as if a sensitive question were used.

This study also examined the question of whether Mod NGT groups, using a sensitive question, would outperform Mod NGT groups using a nonsensitive question. The author hypothesized that since the Mod NGT is supposed to eliminate most inhibitions, it should perform equally as on sensitive or nonsensitive questions. Conversely, the author hypothesized that control groups using nonsensitive questions would outperform control groups using sensitive questions because fewer inhibitions would be raised by the nonsensitive question.

One final objective was to compare all groups using a sensitive question to all groups using a nonsensitive question. It was hypothesized that the groups (whether experimental or control) using the nonsensitive question would face fewer inhibitions and thus outperform the groups with the sensitive question.

The Withholding of Items from the Group

In an earlier chapter the author noted that Cooley (1977) found that each of his NGT groups (seventy-two) withheld ideas from the NGT group to some extent. He also noted that some groups withheld up to 33 percent of their ideas. Although that evidence must be discounted due to the fact that Cooley used a modified NGT process, the subject of possible withholding was deemed worthy of inclusion in this study.

Withholding occurs when a participant in an NGT session writes down an idea and for some reason (possible inhibitions) he/she never presents the idea to the group. Withholding was measured by collecting all 3 x 5 idea cards and/or NGT question sheets from each participant after the NGT session. The items that were withheld are determined by comparing the individual's sheet with the items on the group's list. Any nonpresented items, unless they were obvious duplicates, were considered to be "withheld." The objectives were (1) to determine if any NGT groups withheld a significant number of ideas and (2) if so, to determine whether the experimental groups withheld fewer ideas than the Delbecq NGT groups.

In summary the primary objectives of this exploratory study are (1) to experimentally test whether a modification (Mod NGT) to the silent writing and to the round robin phases of the Delbecq NGT can improve the effectiveness of the NGT by eliminating some of the problems caused by having individuals "read" their ideas aloud; (2) experimentally test whether the relative sensitivity of the NGT question has any effect on the group effectiveness; and (3) to measure to what extent individuals withhold ideas from NGT groups.

Although the author hypothesized that the Mod NGT and the relative sensitivity of the NGT question would effect the groups' output, the relative differences were not expected to be great due to the fact that the modification to the NGT was not a major change and the relative difference in degree of sensitivity of the two NGT questions was not large. As this study was designed to be exploratory, indications and tendencies were considered to be worthwhile as well as major statistical variations.

Measure of Effectiveness

The four treatments (independent variables) were applied to Nominal groups to determine if they caused an increase or decrease in group effectiveness. In this study the measures of group effectiveness (dependent variables) were the level of perceived group satisfaction, the consensual judgement rating of the "top-seven" items generated by the group, the quantity of ideas generated and the number of items withheld from the group. Each of these dependent measures is discussed in detail in Chapter-V.

IV. MAJOR RESEARCH HYPOTHESIS

where x = Mod NGT
y = Delbecq NGT
s = sensitive NGT question
n = nonsensitive NGT question

- H₁ Groups N_x, using Mod NGT, will have a higher level of perceived group satisfaction on each of the individual satisfaction variables than the Control groups N_y.
- H₁₀ Groups N_x, using Mod NGT, will have an equal or lower level of perceived group satisfaction on each of the individual satisfaction variables than the Control groups N_y.
- H₂ Groups N_x, using Mod NGT, will receive higher "top-seven" consensual judgement ratings than the Control groups N_y.
- H₂₀ Groups N_x, using Mod NGT, will receive the same or lower "top-seven" consensual judgement ratings than the Control groups N_y.
- H₃ Groups N_x, using Mod NGT, will generate a greater quantity of items than the Control groups N_y.
- H₃₀ Groups N_x, using Mod NGT, will generate the same or a smaller quantity of items than the Control groups N_y.
- H₄ Groups N_{xs}, using Mod NGT and a sensitive question, will have a higher level of perceived group satisfaction on each of the individual satisfaction variables than the Control groups N_{ys}, using a sensitive question.
- H₄₀ Groups N_{xs}, using Mod NGT and a sensitive question, will have an equal or lower level of perceived group satisfaction on each of the individual satisfaction variables than the Control groups N_{ys}, using a sensitive question.
- H₅ Groups N_{xs}, using Mod NGT and a sensitive question, will receive higher "top-seven" consensual judgement ratings than the Control groups N_{ys}, using a sensitive question.
- H₅₀ Groups N_{xs}, using Mod NGT and a sensitive question, will receive the same or lower "top-seven" consensual judgement ratings than the Control groups N_{ys}, using a sensitive question.

- H_6 Groups N_{XS} , using Mod NGT and a sensitive question, will generate a greater quantity of ideas than the Control groups N_{YS} , using a sensitive question.
- H_{60} Groups N_{XS} , using Mod NGT and a sensitive question, will generate the same or smaller quantity of ideas than the Control groups N_{YS} , using a sensitive question.
- H_7 Groups N_{XN} , using Mod NGT and a nonsensitive question, will generate a higher level of perceived group satisfaction on each of the individual satisfaction variables than the Control groups N_{YN} , using a nonsensitive question.
- H_{70} Groups N_{XN} , using Mod NGT and a nonsensitive question, will generate an equal or lower level of perceived group satisfaction on each of the individual satisfaction variables than the Control groups N_{YN} , using a nonsensitive question.
- H_8 Groups N_{XN} , using Mod NGT and a nonsensitive question will receive higher "top-seven" consensual judgement ratings than the Control Groups N_{YN} , using a nonsensitive question.
- H_{80} Groups N_{XN} , using Mod NGT and a nonsensitive question will receive the same or lower "top-seven" consensual judgement ratings than the Control groups N_{YN} , using a nonsensitive question.
- H_9 Groups N_{XN} , using Mod NGT and a nonsensitive question, will generate a greater quantity of ideas than the Control groups N_{YN} , using a nonsensitive question.
- H_{90} Groups N_{XN} , using Mod NGT and a nonsensitive question, will generate the same or a smaller quantity of ideas than the Control groups N_{YN} , using a nonsensitive question.
- H_{10} Groups N_X , using Mod NGT will withhold significantly fewer items than the Control groups N_Y .
- H_{100} Groups N_X , using Mod NGT will withhold an equal or greater number of items than the Control groups N_Y .

V. RESEARCH DESIGN AND METHODOLOGY

Basic Design

This study was a field experiment designed to (1) gather data on the effectiveness of the proposed modification (Mod NGT); (2) to determine whether the relative sensitivity of the NGT question has any effect on the groups' effectiveness; and (3) to examine if individuals in NGT sessions withhold ideas from the group and, if so, does the use of Mod NGT moderate the amount of withholding.

The subjects for this study were one hundred and forty-four University of Florida Army ROTC cadets who participated in a semiannual Field Training Exercise (FTX). The Experimental Design includes 24 groups divided into four treatments (X=Mod NGT, Y=Delbecq NGT, S=Sensitive NGT Question, N=Nonsensitive NGT Question) as shown in the figure. Subjects were randomly selected (nonvoluntary) and assigned to groups from the cadet ranks using random numbers generated by computer. Each of the basic groups (N_{xs} , N_{xn} , N_{ys} , N_{yn}) had an equal number of subgroups (six).

Each NGT group was comprised of seven members, six active members and a group leader or recorder. This group size was chosen to ensure as large an N as possible for statistical purposes. A group of seven is within the acceptable range suggested by Delbecq et al. (1975) of five to nine. Considering the relatively small number of groups using each of the four treatments, provisions were made to ensure stand-by

| Factor | MODIFIED NGT | | DELBECQ NGT | |
|-------------------------|------------------------|----------------------------|------------------------|----------------------------|
| | Sensitive NGT Question | Non Sensitive NGT Question | Sensitive NGT Question | Non Sensitive NGT Question |
| Treatment | N_{xs} | N_{xn} | N_{ys} | N_{yn} |
| Experimental Subjects | 6 Groups | 6 Groups | 6 Groups | 6 Groups |
| Cadre Evaluators Used | YES | YES | YES | YES |
| Student Evaluators Used | YES | YES | YES | YES |

FIGURE
EXPERIMENTAL FACTORS AND TREATMENTS

participants to ensure equal group sizes both within and between treatments.

Each nominal group consisted of six active members and a recorder. The recorder in this study was a "passive" member who was highly trained to ensure that the prescribed NGT procedure was carefully followed. The use of a "passive" recorder in both the Mod NGT and the Delbecq NGT groups is a variation from the normal Delbecq NGT procedure. Under the Delbecq procedure the recorder is normally an active participant and a regular member of the group. In this study, since all groups were ad hoc there were no existing members. In addition, because it was necessary to ensure for experimental purposes that the procedures were strictly adhered to, "passive" recorders were able to devote more of their time during the NGT session to "policing" the group than "active" recorders would have been able to.

The recorders were senior AROTC cadets who were selected from a larger group of senior cadets on the basis of their leadership abilities. Each of the recorders went through four hours of training on how to conduct an NGT session. As part of their training each of them participated in an actual NGT session. Recorders were also given written instructions (see Appendix B & C) at the NGT session and an additional twenty minute refresher course in the NGT. As the modification to be tested was an administrative type change that did not require a behavioral change on the part of the recorder, each recorder was trained in both of the NGT methods (Delbecq NGT, Mod NGT). Recorders were randomly assigned to the groups by selecting a group number (without any treatment condition identified) from a "hat."

The NGT Questions

The two NGT questions were derived in conjunction with the Army ROTC Cadre (officers) and the cadet staff. The questions were developed following the four step question development procedure outlined by Delbecq et al. (1975, p. 75). The NGT questions were pretested in the NGT training sessions conducted for the recorders.

1. The "sensitive" NGT question selected for use was:

"How can the internal policies, procedures or organization of our local AROTC program be changed to make it more meaningful to cadets?" This question was designed to increase inhibitions since issues addressed were local issues that directly affected the daily lives of the cadets who were already in the program. The question was pretested among the senior cadet officers to ensure that they became emotionally involved with the issues raised by the question. As the items generated in the pretest included questions about the competence of both cadet and cadre officers, the reasonableness of academic and haircut policies and other emotional issues on the local level, the question was judged as acceptable.

2. The "nonsensitive" NGT question selected for use was:

"Given existing monetary and personnel limitations, are there any ways of making AROTC more attractive to potential recruits?" This question was designed to be more neutral or less inhibiting than the "sensitive" question. This question addressed issues that were less relevant to the cadets already enrolled in the ROTC program.

The responses generated during the pretest touched on less emotional issues such as the number of public⁴ demonstrations, better advertising, and visiting more high schools. Since the items generated by the non-sensitive question seldom mentioned personalities and generally centered on the activities of the cadre rather than the cadets, the nonsensitive question was judged to be relatively less inhibiting than the sensitive question.

The two questions selected for use are not radically different in regard to degree of sensitivity. This is due to the fact that (1) AROTC officials would not allow extremely sensitive questions to be used and (2) the use of any totally nonsensitive question would lead to a low level of involvement (or boredom) on the part of the cadets.

Methods and Procedures

The experiment was conducted according to the following format:

1. Arrangements were made and final approvals were obtained from the administration of the Army ROTC program.
2. The AROTC program was asked to develop and approve the problem statement according to the four step Delbecq process.
3. The FTX site (Oleno State Park, High Springs, Florida) was inspected to ensure there was adequate indoor space for each of the twenty-four NGT sessions.

4. Recorders were trained for two hours on both NGT procedures two weeks prior to the FTX. Possible violations of the procedures were demonstrated and ways of handling them were discussed in detail. Each recorder was given detailed instructions on how each NGT session was to be constructed.
5. Recorders participated in an actual two hour NGT session, one week prior to the FTX. This was to ensure each had some "hands on" experience with the process.
6. The NGT questions and the satisfaction questionnaire were pretested at the recorders NGT training sessions.
7. The responses generated by the recorders NGT sessions were presented to the Cadre to ensure the responses were in line with their expectations. The nonsensitive NGT question was modified slightly as a result of this step. The final NGT questions are listed in the previous section.
8. Satisfaction scores from the recorder sessions were factor analyzed and the instrument was refined to eliminate some ambiguous phrases.
9. Tape recorders were acquired to ensure at least a random sampling of the NGT sessions. The sessions were recorded to allow for a later check on adherence to procedures.
10. The mess and the recreation hall were prepared for the NGT sessions on the day of the FTX (October 27, 1978).

11. Recorders were randomly assigned to groups and a final twenty minute training session was held.
12. Each recorder was given the necessary materials prior to the NGT session. Materials included either a detailed instruction sheet for the N_x groups (see Appendix B) or an instruction sheet for the N_y groups (see Appendix C), seven sheets containing the NGT question (either sensitive or nonsensitive), four flip chart sheets, a tape recorder (with the exception of groups 17-20), a marking pen, seven pencils, masking tape, twelve group members individual voting sheets, two group leaders summary voting sheets, six satisfaction questionnaires (see Appendix D), and two blank 90 minute cassettes. In addition, N_x group leaders received approximately ninety blank 3 x 5 cards for presenting ideas.
13. The cadets were called to formation and randomly assigned to groups. The group leaders took their six members to their assigned table and the session began.

The N_y Control Group NGT Sessions

The control group sessions used the Delbecq NGT format. The session began by counting the members to ensure the proper number of participants (6). The recorder began the NGT session by describing objectives, procedures and rules for the NGT session. This introduction lasted no longer than five minutes. The recorder then noted the time, started the tape recorder and the session began. The recorder passed

out the NGT question and the listing sheets to each participant. The problem statement was read and the ten minute silent writing period began. The session proceeded through the round robin, serial discussion and voting phases as described by Delbecq et al. (1975). During the voting phase the group was asked to select the "top-seven" ideas by ranking (using 7 for the best and 1 for their last selection for the "top-seven"). As the session concluded, the recorder noted the time and turned off the tape recorder.

The participants were asked to provide, if they chose to, any clarifying statements that might make their "top-seven" items easier to understand by outsiders who were not exposed to the group's discussion. Brevity was encouraged and a short paragraph on each item was the outside limit on comments. These comments were used by the judges to aid them in reaching a consensual judgement rating of each group's output. The recorder then handed out the satisfaction questionnaires; after they were completed he collected them and the listing sheets used by each of the participants. The cadets were thanked for their cooperation and were asked to leave quietly. The recorder then filled out the summary voting form noting the elapsed time, the "top-seven" ideas (with clarifying statements), the total number of ideas listed on the flip chart sheets and any problems or variations to the prescribed format that might have occurred (and during what portion of the session it occurred). The recorder noted the group number on each of the flip chart sheets, the listing sheets collected from the participants, the two cassette tapes and each of the satisfaction questionnaires filled out by the participants. All of the materials were then placed in a large envelope and turned into one of the four supervisors who were monitoring the NGT sessions.

The Mod NGT Session

The N_x Experimental groups used the Mod NGT procedure in their sessions. The N_x groups proceeded exactly as the N_y groups described above with the following exceptions:

1. During the silent writing phase each participant listed each idea on a separate 3 x 5 card rather than on a listing sheet.
2. During the round robin phase each participant dropped one folded 3 x 5 card in the hopper each round. The card could either contain an idea or was blank if the individual wanted to "pass." The recorder read each idea aloud, and listed it on the flip chart. Any idea that was unclear to the recorder or too lengthy was not listed. Instead the recorder read it again out loud and suggested to the group that the idea needed rewording (or shortening), and that the idea should be resubmitted by someone in a subsequent round.
3. After the N_x session concluded, the recorder asked each participant to drop all his remaining 3 x 5 cards in the hopper (whether used or blank). The recorder stressed to the group that cards that were not submitted during the session must be put in the hopper regardless of why the participant never presented the idea to the group. After the group left, the recorder was asked to sort out any cards containing unsubmitted ideas and turn them into the project leader along with all the cards submitted by the group.

Other Procedures

- A. To ensure that experimental procedures were followed, four supervisors were present to answer questions and spot potential problems.
- B. Sensitive and nonsensitive NGT questions were alternated to eliminate any copying of ideas from adjacent groups.
- C. Cadre officers were not allowed to directly oversee any group so that the participants felt free to express their ideas.

Problems

The experiment went very smoothly with the following exceptions:

1. One hall became somewhat stuffy and noise from other tables was noticeable.
2. Several tape recorders malfunctioned causing several groups to go unrecorded.
3. The presence of the tape recorders was obviously a distraction to the group leader and it was received apprehensively by some participants.

Measurement of Variables and Data Collection

The dependent variables that were selected to test the relative effectiveness of the two Nominal Group Techniques, and the part played by sensitive and nonsensitive questions were:

1. The perceived group satisfaction with each of the sixteen individual satisfaction variables;

2. The consensual judgement rating of the "top-seven" items selected by the group;
3. The quantity of ideas generated by the group; and
4. Whether individuals withheld items from the NGT group.

The rationale for selecting each of these measures and a discussion of the data collection procedures is presented in the following sections.

Level of Perceived Group Satisfaction

Group satisfaction was chosen as a dependent measure because even when highly creative decisions are developed, if the decision makers feel dissatisfied with the process or cannot accept the solution, the decision may fail to be adopted (Van de Ven, 1974). More specifically, since in this study it was hypothesized that the proposed modifications will make the NGT process more appealing to the participants, there must be some objective measure to ensure the modifications increase the groups satisfaction with the technique.

There are sixteen independent measures of perceived group satisfaction in this study. Eleven of them cover satisfaction with the group process while five cover satisfaction with the groups output. Participant satisfaction was measured using a two part satisfaction questionnaire.

The questionnaire (see Appendix D) was filled out by each participant immediately following the conclusion of their NGT session. Although parts of the questionnaire were derived from instruments utilized by Van de Ven (1974), Frederick (1976) and Cooley (1977), many of the questions were developed to fit the specific needs of this

study. The questionnaire was pretested for clarity using NGT recorders and other AROTC personnel as subjects. Each of the sixteen satisfaction questions is answered on a 0-10 Likert-type scale.

Each individual satisfaction variable was treated separately as an individual measure.

Process

1. Traced Back--can an idea you presented to the group be traced back to you?
2. Refuse to Defend--how free were you to refuse to defend your ideas?
3. Free to Pass--did you feel free to pass without embarrassment?
4. Disagree with an Item--were you free to disagree with an item?
5. Seek Clarification--were you free to seek clarification of items?
6. Fair Consideration--were your ideas given fair consideration by the group?
7. Opportunity to Present--did you have enough opportunities to present your ideas?
8. Time Efficient--was the process time efficient?
9. Not Dominated--was the group dominated by anyone?
10. Group Leader--satisfied with the performance of the group leader?
11. All Aspects--satisfied with all procedural aspects of the process?

Output

12. Quantity--satisfied with the quantity of ideas?
13. Quality--satisfied with the quality of ideas?
14. Fair Representation--satisfied items generated are a fair representation of the groups' feeling?

15. Output as your Position--satisfied to present groups output as your position?
16. Overall Goals--did the group attain its overall goals?

Consensual Judgement Rating of the Ideas Generated

Cooley (1977) conducted a comprehensive review of the literature related to measuring the quality of group decisions. He notes that although there appears to be a consensus among researchers that the quality of the idea or solution is a critical element in the measurement of effectiveness, some have evaded the issue by noting that an objective measure of quality may not exist. His review also indicated that no standardized procedure exists so one must develop an approach for evaluating quality that meets one's specific needs.

Delbecq and Van de Ven (the developers of the NGT) do not utilize a quality measure in their experimental testing of the NGT (Van de Ven and Delbecq, 1974). Cooley (1977) attempts to develop a suitable quality standard for the NGT but concludes that measures of quality are subjective in nature and further suggests that "average quality need not be evaluated for tasks similar to the one used in this study" (p. 219). He also concluded that "Quantity may in fact be the only measure of effectiveness required" (p. 219).

Despite the problems involved in measuring quality, one measure, the quality of the "top-items" generated by the group, used by Cooley (1977) seems most appropriate for Nominal groups. Since Nominal groups differ from other group decision techniques, in that the group must evaluate and select the highest priority items, a quality measure of this evaluation and selection process would be an important indicator of the effectiveness of the Nominal group. The term quality is somewhat

misleading in that there is no absolute measure of the quality of an idea. The closest alternative has been having a panel of experts make ratings or judgements as to the relative importance or quality of an item. In this study a facsimile of a quality rating is utilized as the second dependent measure. It is called the Consensual Judgement Rating. Thus the second dependent measure utilized in this study is the Consensual Judgement Rating of the "top-seven" items generated by each group.

The "top-seven" items selected by each group were noted by the recorder at the end of each session. The judging procedures used in this study are partially adopted from those developed by Cooley (1977) in his study of group effectiveness using a modified NGT. Six judges were used in the judging process. Three cadre officers and three cadet leaders were selected who were familiar with AROTC program.

Each of the six judges was given a rater's instruction sheet (see Appendix E) and two stacks of eighty-four responses. The first stack contained responses from question A (the nonsensitive question) and the second contained the responses to question B (sensitive). Any clarifying comments included by the group were also placed on the cards. As twelve groups answered each question and each group generated seven items, the total for each was eighty-four. Each response was numbered but they could not in any way be traced to the group or process it originated from. Each rater was asked to rate each item as it responded to the NGT question on feasibility, importance and/or merit. There were no exact duplicates and judges were asked to clip "duplicates" together so they would be judged as equal. Each rater used a modified alternation ranking procedure which placed equal (items of similar

quality) items in the same category starting at the very best, then alternating to the very worst; then grouping the second best and the second worst etc. until all items were ranked. The same procedure was then followed for question B.

Interater reliabilities were then run using Kendall's Coefficient of Concordance "W" (Siegel, 1956). Kendall's "W" is a nonparametric correlation coefficient which ranks judges ratings on an ordinal scale. Interater reliabilities were run between cadre officers, between cadet raters, and between all six combined using the BMDP (P3S) statistical package (Brown, 1977). The Kendall's "W" correlations for each question were (1) Cadre A = .60, B = .64; (2) Cadets A = .57, B = .47; and (3) Cadre and Cadets combined A = .39 and B = .35. All coefficients were significant to the .05 level. The coefficients for the cadre were moderately high indicating a reasonable amount of agreement between the cadre officers. The coefficients for the cadets demonstrate that there was only a moderate amount of agreement between the cadet officers on the relative quality of the items generated. The coefficients for the combined (cadre and cadets) ratings indicate a relatively low level of agreement between the cadre and the cadet officers. Such a "low" coefficient was also an indication that the consensual judgement scores of the cadre and the cadets might tend to move in opposite directions.

Quantity of Ideas

Van de Ven (1974) notes that the crucial factor facilitating creative decision making (during the fact finding stage of problem solving) is the generation of a large number of ideas relevant to the

problem. During the next step of creative decision making (evaluation) a large number of ideas provides the opportunity for the group to undertake an exhaustive evaluation of the problem area and a reconceptualization of solutions which have not previously existed. The quantity of ideas was selected as a dependent measure because "the greater the quantity of ideas identified by a decision process, the greater number of ideas considered for evaluation, and the greater the potential for creative decision making" (Van de Ven, 1974, p. 26). A review of the literature demonstrated that nearly every major study on the NGT has included a quantity variable as one of its dependent measures.

In this study the quantity of ideas was obtained from the flip chart recording sheets utilized in each group. The quantity measure is a numerical score obtained by simply counting the number of ideas generated by the group. Although unrecorded items (those items listed by individuals but not presented to the group) will be considered in this study, they are not considered as part of the quantity of items generated by the group.

Unrecorded Items

Listing sheets (and the 3 x 5 cards in the N_x groups) were collected from each participant following the NGT session. The group number was placed on each sheet and the project leader later compared ideas listed by each participant to the ideas recorded on the flip charts to see if there was any evidence of the withholding of ideas. An unrecorded item that was a close duplicate of a recorded item was not counted as unrecorded.

Additional Data that Were Collected

In addition to the primary measurements (satisfaction, consensual judgement rating, quantity and unrecorded ideas) other data were collected for comparison purposes. These additional measurements include:

1. Time--The elapsed time of each NGT session was noted by the recorder. This might provide evidence as to whether any of the treatments took significantly less or more time to complete.
2. Subjective Evaluations--As part of the satisfaction questionnaire, each participant was asked for narrative comments relating to: What aspects of the process did you like most? what aspects of the process did you like the least?; do you have any suggestions for the improvement of the process? and do you have any general comments about the process, the recorder or the experiment?
3. Adherence to Experimental Procedures--Twenty NGT groups were given tape recorders so that a permanent record would be available for use by the project leader in determining whether the proper experimental procedures were followed. Participants were assured that safeguards were instituted to ensure the tapes would only be used by the experimenter and would not be available to superiors. Of those original twenty, seven recorders malfunctioned, leaving thirteen groups that were at least partially recorded. Although background noise is bad, review of the tapes is still possible.

The project leader sampled major portions of each tape to ensure the NGT process was followed. This information was used in conjunction with recorder comments; observations of the four supervisors present at the NGT sessions; and evidence obtained by examining the listing sheets, recording sheets and voting sheets to determine if any group violated experimental procedures. After close examination, two groups were found to be questionable in some aspects but acceptable overall. In the first group, on two occasions, the leader asked that an item be partially explained before he wrote it on the flip chart. In the second group the leader laughed when a participant presented one particular idea.

4. Recorder Comments--At the conclusion of each session the recorder was asked to report his comments on how the meeting progressed and whether any problems occurred. If problems occurred, the recorder was asked to note at which point(s) in the meeting did the problem(s) occur.
5. Other Data Were Collected on:
 - A. the sex of the group leader;
 - B. the number of items crossed out by each group;
 - C. the number of votes taken by the group; and
 - D. the number of votes the group gave to each of the top seven items.

Statistical Analysis of Data

The data gathered from groups N_{XS} , N_{Xn} , N_{YS} , and N_{Yn} were used to test the research hypotheses presented in Section IV. The experiment was a completely randomized, fixed effects, post-test only control group design. The two primary independent variables were Mod NGT and the sensitive and nonsensitive question. The primary dependent measures were the perceived group satisfaction, the consensual judgement rating of the "top-seven," the quantity of ideas and the number of items withheld.

Data generated by each group were coded and keypunched. Data were analyzed using the BMDP p series statistical package. In addition histograms and a variety of descriptive statistics were run for each of the major variables. The data from the dependent variables were treated in the following manner.

Perceived Group Satisfaction

Each member of every subgroup completed a two part satisfaction questionnaire. Each of the sixteen items was scored on a 0-10 scale by each participant. As there is no evidence to conclude that the interval between 0 and 1, 1 and 2, 9 and 10 were equivalent on an interval scale, the satisfaction data were treated as ordinal. Comparisons were made between group means using the nonparametric Kruskal-Wallis univariate ANOVA test. A Mann-Whitney "U" statistic was also generated for each satisfaction variable. The Null Hypothesis for each comparison was that each of the treatments have equal means on the dependent variable satisfaction. Each of the sixteen individual satisfaction variables were treated independently and analyzed for each of the following treatments:

| | |
|------------------------|-------------------------------|
| $N_x \times N_y$ | where x = Mod NGT |
| $N_{xs} \times N_{ys}$ | y = Delbecq NGT |
| $N_{sn} \times N_{yn}$ | s = sensitive NGT question |
| $N_{xs} \times N_{xn}$ | n = nonsensitive NGT question |
| $N_{ys} \times N_{yn}$ | |
| $N_s \times N_n$ | |

All significance levels were set at .05 for two tailed distributions.

Consensual Judgement Rating

Each of the subgroups selected (voted on) its "top-seven" items. These items were compiled and rated by judges on a thirteen item (maximum) alternation ranking scale. As the judges were asked to rank (rather than rate) each item, using a nonprescribed number of ranks, the ratings were treated on an ordinal scale. Comparisons were made between group means using the nonparametric Kruskal-Wallis univariate ANOVA test. A Mann-Whitney "U" statistic was also generated for each comparison between groups. The Null Hypothesis for each comparison was that each of the treatments had equal means on the dependent variable consensual judgement rating. Consensual judgement scores were compared between each of the following treatments:

| | |
|------------------------|------------------------|
| $N_x \times N_y$ | $N_{xs} \times N_{xn}$ |
| $N_{xs} \times N_{ys}$ | $N_{ys} \times N_{yn}$ |
| $N_{xn} \times N_{yn}$ | $N_s \times N_n$ |

All significance levels were set at .05 for two tailed distributions.

Quantity of Ideas

The total number of ideas generated by each subgroup will be treated as that subgroup's quantity score. The quantity score was

treated as an interval scale. Univariate ANOVA was used to test the Null Hypothesis that the treatments had equal means on the dependent variable quantity of ideas. A students "t" statistic was also generated for each comparison. The quantity of ideas were compared between each of the following treatments:

$$\begin{array}{ll}
 N_x & \times N_y \\
 N_{xs} & \times N_{ys} \\
 N_{xn} & \times N_{yn}
 \end{array}
 \qquad
 \begin{array}{ll}
 N_{xs} & \times N_{xn} \\
 N_{ys} & \times N_{yn} \\
 N_s & \times N_n
 \end{array}$$

All significance levels were set at .05 for two tailed distributions.

Number of Withheld Items

At the conclusion of each session 3 x 5 cards, listing sheets and flip chart pages were collected by the group leader. Later comparisons were made between listed ideas and recorded ideas to see which were withheld from the group. The number of withheld ideas was treated on an interval scale. Univariate ANOVA was used to test the Null Hypothesis that the treatments had equal means on the dependent variable number of withheld items. A student "t" statistic was also generated for each comparison. The number of withheld items were compared between each of the following treatments:

$$\begin{array}{ll}
 N_x & \times N_y \\
 N_{xn} & \times N_{ys} \\
 N_{xn} & \times N_{yn}
 \end{array}
 \qquad
 \begin{array}{ll}
 N_{xs} & \times N_{xn} \\
 N_{ys} & \times N_{yn} \\
 N_s & \times N_n
 \end{array}$$

All significance levels were set at .05 for two tailed distributions.

Operational Definitions

For purposes of this study the terms in this section shall be defined as noted:

NGT--The Nominal Group Technique.

Delbecq NGT--The particular variation of the NGT described by Delbecq et al., (1975) on pages 66-69 (A.K.A.--Delbecq technique or the traditional NGT).

Mod NGT--The particular variation of the Delbecq NGT which requires participants to place their ideas on 3 x 5 cards rather than reading them aloud to the group. Mod NGT is described in detail in Chapter III.

Sensitive NGT Question--The NGT question relating to the improvement of the local ROTC program. Designed to raise the inhibitions of participants to a level higher than if a nonsensitive question were used (see Chapter III).

Nonsensitive NGT Question--the NGT question relating to making the ROTC program more attractive to potential recruits. Designed to raise a lower level of inhibitions than the sensitive question (see Chapter III).

Interactive Group--The traditional format for most meetings that has little structure and few controls. There is (1) unstructured group discussion for obtaining and pooling ideas of the participants and (2) majority voting in priorities by hand count (Van de Ven, 1974).

Quantity of Ideas Generated--A dependent variable consisting of the number of ideas generated by the group. The quantity measured is described in detail in Chapter V.

Consensual Judgement Rating of Ideas Generated--For this study, the consensual judgement rating is the rating assigned to each item by a panel of independent judges using a modified alternation ranking (see Chapter V).

Perceived Group Satisfaction--The rating of each participant on a 0-10 Likert-type scale for each of sixteen independent satisfaction variables (see Chapter V).

Improved Effectiveness--For this study, when the measured level of perceived satisfaction, consensual judgement ratings, quantity of ideas or the number of withheld ideas increases so that the new level is significantly (statistically at the .05 level) higher than that of the control group.

Elapsed Time of the NGT--The recorded clock time from the reading of the Problem Statement to the end of the final voting phase.

Undisclosed Items--For this study any item written down by a participant on his/her listing sheet (or 3 x 5 cards) but not presented to the group for recording, regardless of the reason (close duplicates excluded).

N_y--The set of Control Groups that used the Delbecq NGT.

N_x--The set of Experimental Groups that used the Mod NGT variation of the NGT.

N_s--The set of groups using the sensitive NGT question.

N_n--The set of groups using the nonsensitive NGT question.

Recorder--For this study a passive participant in an NGT session who explains procedures, keeps order, records ideas on flip charts, and counts the votes during the voting phase. He/she does not add ideas, clarify ideas or participate in the voting of the group.

VII. RESEARCH RESULTS

All dependent measures (Satisfaction, Consensual Judgement, Quantity, Items Withheld) were compared across each of the following treatments using the data generated by this experiment:

N_x with N_y

N_{xs} with N_{ys}

N_{xn} with N_{yn}

N_{xs} with N_{xn}

N_{ys} with N_{yn}

N_s with N_n

where x = Mod NGT (Exper)
 y = Delbecq NGT (control)
 s = Sensitive NGT Question
 n = Nonsensitive NGT Question

Comparison of N_x with N_y Groups

H_1 suggested that experimental groups would attain a higher level of perceived group satisfaction than the control groups on each of the individual satisfaction variables. The data suggest that H_1 is true for two satisfaction variables (see Table 1). Experimental groups were more satisfied that ideas they presented could not be "traced back" to them. As one of the prime reasons for Mod NGT was to avoid the linking of ideas and individuals, this finding is a confirmation that this linkage is more difficult under Mod NGT. N_x groups were also more satisfied with the "quantity of ideas produced" by the group. Although

TABLE 1
COMPARISON OF N_x GROUPS WITH N_y GROUPS ON
PERCEIVED GROUP SATISFACTION

| Satis. Variable | N_x (N=72) Rank Sum | N_y (N=66) Rank Sum | Kruskal Test Stat. | Level Sign. |
|--------------------|--------------------------|--------------------------|-----------------------|----------------|
| 1 Traced | 5681 | 3909 | 8.5 | .0034* |
| 2 Defend | 5221 | 4375 | .9 | .34 |
| 3 Pass | 5136 | 4454 | .44 | .50 |
| 4 Disagree | 5091 | 4500 | .15 | .69 |
| 5 Clarify | 4849 | 4741 | .48 | .49 |
| 6 Consider. | 4971 | 4620 | .02 | .89 |
| 7 Opport. | 5289 | 4301 | 1.6 | .20 |
| 8 Time Eff. | 5086 | 4505 | .12 | .72 |
| 9 Not Dom | 5234 | 4357 | 1.01 | .31 |
| 10 Grp Lead. | 4993 | 4597 | .001 | .96 |
| 11 All Proc. | 5001 | 4590 | 0.0 | 1.00 |
| 12 Quant. | 5817 | 3773 | 12.7 | .0004* |
| 13 Qual. | 5088 | 4502 | .13 | .71 |
| 14 Fair | 5215 | 4375 | .85 | .36 |
| 15 Yours | 5037 | 4553 | .02 | .89 |
| 16 Goals | 5147 | 4444 | .39 | .53 |

*Significant at the .05 level (two tailed)

none of the other variables were statistically significant, all fourteen did have higher rank sums than the control groups.

H_2 suggested that the N_x groups would receive a higher consensual judgement rating for its "top-seven" items than the N_y groups. Cadre ACR (Average Cadre Ranking) rankings offered no significant evidence to support that conclusion. Based on the assumption that the Cadre, with its years of experience, would be best able to judge the quality of any suggestion, it would seem that the N_x groups ideas were no better than the N_y groups. When the Cadre (ACR) rankings were weighted with the rating of the group (Top item = 7 points, next item = 6 points, etc.) or with the number of votes given to the item during the group vote, the results were still not significant.

However, when student cadet officers rankings (ASR) were used, the N_x groups were significantly better than the N_y groups. (see Table 2). Student (ASR) rankings weighted with points or group votes failed to produce significant results. Although not significant statistically, each of the remaining six rank sums was higher for the experimental groups than for the control groups.

H_3 states that the experimental groups will produce a larger number of ideas than the control group. Statistically that hypothesis must be rejected as neither the net quantity (total, less crossed out items) nor the total quantity (net, plus crossed out items) proved to be significant (see Table 3). Crossed out items were added back in, based on the assumption that the combining of items is not a group judgement of low quality but rather to join similar items to simplify the voting process.

TABLE 2
COMPARISON OF N_x GROUPS WITH N_y GROUPS ON
CONSENSUAL JUDGEMENT SCORES

| Variable | N_x (N=84) Rank Sum | x | N_y (N=84) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-----------------------------|--------------------------|---|--------------------------|-----------------------|----------------|
| Aver. Cad. Ranking (ACR) | 7304 | | 6891 | .43 | .51 |
| ACR x Points | 7198 | | 6998 | .10 | .75 |
| ACR x Votes | 7273 | | 6922 | .30 | .58 |
| Aver. Stu. Ranking (ASR) | 7776 | | 6420 | 4.6 | .0305* |
| ASR x Points | 7418 | | 6778 | 1.03 | .31 |
| ASR x Votes | 7645 | | 6550 | 3.01 | .08 |
| Num. Votes for Item | 7235 | | 6960 | .19 | .66 |

*Significant at the .05 level (two tailed)

Research by Cooley (1977) indicated that some members of Nominal groups withhold ideas. The Data (see Table 4) seem to indicate that all groups withhold to some degree but that the N_x groups withhold significantly less than the N_y groups confirming H_{10} . Converting the variable to a percentage of the net items generated does not yield any statistically significant results. Similarly an analysis of Table 5, "other" variables, yields no additional statistically significant results.

Comparison of N_{xs} with N_{ys} Groups

The data indicate that N_{xs} groups are more satisfied than control groups using a sensitive question on three variables (see Table 6). They are "traced back," "time efficient," and satisfaction with the "quantity of ideas produced." All twelve other variables moved in the expected direction but none were significant.

All three of the cadre consensual judgement ranking scores (ACR, ACR x Points, ACR x Votes) were not significant between N_{xs} and N_{ys} but the student ranking (ASR) and the student rankings (ASR) weighted by the group vote were both significant indicating that the N_{xs} groups were superior to the N_{ys} groups on these consensual judgement measures (see Table 7).

Comparing the N_{xs} and N_{ys} groups on quantity provided no significant data (see Table 8). The comparison of the groups on withheld items yielded no significant results (see Table 9). The comparison of "other" variables also failed to yield any significant results (see Table 10).

TABLE 3

COMPARISON OF N_x GROUPS WITH N_y GROUPS ON
QUANTITY OF IDEAS GENERATED

| Variable | N_x (N=12) Group Mean | x | N_y (N=12) Group Mean | ANOVA F Value | Level Sign. |
|--------------------------------|----------------------------|---|----------------------------|------------------|----------------|
| Net Quantity | 26.92 | | 22.83 | 1.05 | .32 |
| Total (Crossed Out and Net) | 34.33 | | 26.50 | 3.90 | .06 |

TABLE 4

COMPARISON OF N_x GROUPS WITH N_y GROUPS ON
WITHHELD ITEMS

| Variable | N_x (N=12) Group Mean | x | N_y (N=12) Group Mean | ANOVA F Value | Level Sign. |
|----------------------|----------------------------|---|----------------------------|------------------|----------------|
| Number Withheld | 3.08 | | 9.30 | 13.7 | .0014* |
| % Withheld of Net | 16.25 | | 39.58 | 3.22 | .086 |

*Significant at the .05 level (tail area probability)

TABLE 5

COMPARISON OF N_x GROUPS WITH N_y GROUPS ON
OTHER VARIABLES

| Variable | N_x (N=12) Group Mean | x | N_y (N=12) Group Mean | ANOVA F Value | Level Sign. |
|------------------|----------------------------|---|----------------------------|------------------|----------------|
| Elapsed Time | 99.17 | | 86.58 | 2.99 | .098 |
| # Crossed Out | 7.4 | | 3.75 | 2.39 | .14 |
| % Crossed Out | 21.5 | | 14.0 | 1.25 | .28 |
| # of Votes Taken | 1.333 | | 1.5 | .64 | .42 |

TABLE 6
COMPARISON OF N_{XS} GROUPS WITH N_{YS} GROUPS ON
PERCEIVED GROUP SATISFACTION

| Satis. Variable | N_{XS} (N=36) Rank Sum | N_{YS} (N=30) Rank Sum | Kruskal Test Stat. | Level Sign. |
|--------------------|-----------------------------|-----------------------------|-----------------------|----------------|
| 1 Traced | 1436 | 775 | 9.2 | .0024* |
| 2 Defend | 1276 | 935 | .90 | .34 |
| 3 Pass | 1174 | 1037 | .26 | .61 |
| 4 Disagree | 1221 | 990 | .04 | .83 |
| 5 Clarify | 1113 | 1098 | 1.57 | .21 |
| 6 Consider | 1137 | 1073 | .81 | .36 |
| 7 Opport. | 1224 | 986 | .06 | .80 |
| 8 Time Eff. | 1386 | 824 | 5.5 | .0192* |
| 9 Not Dom. | 1331 | 879 | 2.85 | .0913 |
| 10 Grp. Lead. | 1302 | 909 | 1.76 | .18 |
| 11 All Proc. | 1311 | 899 | 1.92 | .16 |
| 12 Quant. | 1362 | 849 | 4.26 | .0388* |
| 13 Qual. | 1263 | 947 | .58 | .45 |
| 14 Fair | 1225 | 986 | .06 | .80 |
| 15 Yours | 1224 | 986 | .06 | .80 |
| 16 Goals | 1219 | 992 | .03 | .86 |

*Significant at the .05 level (two tailed)

TABLE 7
COMPARISON OF N_{XS} GROUPS WITH N_{YS} GROUPS ON
CONSENSUAL JUDGEMENT SCORES

| Variable | N _{XS} (N=42) Rank Sum | x N _{YS} (N=42) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-----------------------------|------------------------------------|--------------------------------------|-----------------------|----------------|
| Aver. Cad. Ranking (ACR) | 1810 | 1759 | .05 | .81 |
| ACR x Points | 1768 | 1802 | .02 | .88 |
| ACR x Votes | 1889 | 1680 | .87 | .35 |
| Aver. Stu. Ranking (ASR) | 2095 | 1474 | 7.8 | .0052* |
| ASR x Points | 1977 | 1593 | 2.95 | .086 |
| ASR x Votes | 2169 | 1400 | 11.8 | .0006* |
| Num. Votes for Item | 1995 | 1575 | 3.56 | .0595 |

*Significant at the .05 level (two tailed)

TABLE 8

COMPARISON OF N_{xs} GROUPS WITH N_{ys} GROUPS ON
QUANTITY OF IDEAS GENERATED

| Variable | N_{xs} (N=6) Group Mean | x | N_{ys} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|--------------------------------|------------------------------|---|------------------------------|------------------|----------------|
| Net Quantity | 24.17 | | 23.67 | .01 | .94 |
| Total (Crossed Out and Net) | 33.00 | | 29.66 | .30 | .59 |

TABLE 9

COMPARISON OF N_{xs} GROUPS WITH N_{ys} GROUPS ON
WITHHELD ITEMS

| Variable | N_{xs} (N=6) Group Mean | x | N_{ys} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|----------------------|------------------------------|---|------------------------------|------------------|----------------|
| Number Withheld | 3.33 | | 8.29 | 3.21 | .098 |
| % Withheld of Net | 20.67 | | 23.83 | .034 | .86 |

TABLE 10

COMPARISON OF N_{xs} GROUPS WITH N_{ys} GROUPS ON
OTHER VARIABLES

| Variable | N_{xs} (N=6) Group Mean | x | N_{ys} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|---------------------|------------------------------|---|------------------------------|------------------|----------------|
| Elapsed Time | 88.0 | | 92.67 | .39 | .54 |
| # Crossed Out | 8.83 | | 6.0 | .52 | .48 |
| % Crossed Out | 26.8 | | 19.1 | .54 | .48 |
| # of Votes Taken | 1.5 | | 1.67 | .29 | .60 |

Comparison of N_{xn} with N_{yn} Groups

The comparison of N_{xn} and N_{yn} on satisfaction indicated that N_{xn} groups were significantly more satisfied with the "quantity" (see Table 11) than the N_{yn} groups. Consensual judgement ratings were compared for N_{xn} and N_{yn} groups; no significant results were obtained (see Table 12). Comparison on the quantity of items, however, indicates that the experimental groups perform significantly better than the control groups when the total number of items are compared (see Table 13).

The data on withheld items indicate (see Table 14) that the N_{xs} groups significantly outperform the N_{yn} groups on both the number and the percent of items withheld (with a fewer number of withheld items being the more desirable). Analysis of "other" variables indicates that the Mod NGT groups sessions lasted significantly longer than the control groups (see Table 15).

Comparison of N_{xs} with N_{xn} Groups

It was generally expected that experimental groups using sensitive questions would perform at the same level (there would be no significant differences) as experimental groups using a nonsensitive question. This would occur because the experimental treatment would eliminate any inhibitions raised by a sensitive question thus making the sensitive and the nonsensitive treatments essentially equal. On the dependent variable satisfaction, this did not prove to be true for the measures "traced back" and the "not dominated" because in both cases the N_{xs} groups significantly outperformed the N_{xn} groups. The remaining (see Table 16) variables show no significant variation in either direction.

TABLE 11
COMPARISON OF N_{xn} GROUPS WITH N_{yn} GROUPS ON
PERCEIVED GROUP SATISFACTION

| Satis. Variable | N_{xn} (N=36) Rank Sum | N_{yn} (N=36) Rank Sum | Kruskal Test Stat. | Level Sign. |
|--------------------|-----------------------------|-----------------------------|-----------------------|----------------|
| 1 Traced | 1415 | 1213 | 1.32 | .25 |
| 2 Defend | 1355 | 1273 | .24 | .63 |
| 3 Pass | 1412 | 1215 | 1.63 | .20 |
| 4 Disagree | 1352 | 1275 | .20 | .65 |
| 5 Clarify | 1343 | 1285 | .11 | .72 |
| 6 Consider | 1371 | 1256 | .44 | .50 |
| 7 Opport. | 1453 | 1174 | 2.7 | .1099 |
| 8 Time Eff. | 1168 | 1459 | 2.7 | .098 |
| 9 Not Dom. | 1279 | 1348 | .16 | .69 |
| 10 Grp. Lead. | 1192 | 1435 | 2.11 | .15 |
| 11 All Proc. | 1216 | 1412 | 1.28 | .26 |
| 12 Quant. | 1566 | 1062 | 8.5 | .0035* |
| 13 Qual. | 1296 | 1333 | .048 | .83 |
| 14 Fair | 1395 | 1233 | .87 | .35 |
| 15 Yours | 1322 | 1305 | .01 | .92 |
| 16 Goals | 1362 | 1266 | .30 | .58 |

*Significant at the .05 level (two tailed)

TABLE 12
COMPARISON OF N_{xn} GROUPS WITH N_{yn} GROUPS ON
CONSENSUAL JUDGEMENT SCORES

| Variable | N_{xn} (N=42) Rank Sum | x | N_{yn} (N=42) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-----------------------------|-----------------------------|---|-----------------------------|-----------------------|----------------|
| Aver. Cad. Ranking (ACR) | 1860 | | 1710 | .46 | .50 |
| ACR x Points | 1855 | | 1715 | .39 | .53 |
| ACR x Votes | 1782 | | 1878 | .00 | .98 |
| Aver. Stu. Ranking (ASR) | 1830 | | 1739 | .17 | .68 |
| ASR x Points | 1770 | | 1800 | .12 | .89 |
| ASR x Votes | 1709 | | 1861 | .46 | .50 |
| Num. Votes for Item | 1675 | | 1895 | .97 | .32 |

*Significant at the .05 level (two tailed)

TABLE 13

COMPARISON OF N_{xn} GROUPS WITH N_{yn} GROUPS ON
QUANTITY OF IDEAS GENERATED

| Variable | N_{xn} (N=6) Group Mean | x | N_{yn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|--------------------------------|------------------------------|---|------------------------------|------------------|----------------|
| Net Quantity | 29.67 | | 22.00 | 1.93 | .19 |
| Total (Crossed Out and Net) | 35.67 | | 23.5 | 5.85 | .0361* |

*Significant at the .05 level (tail area probability).

TABLE 14

COMPARISON OF N_{xn} GROUPS WITH N_{yn} GROUPS ON
WITHHELD ITEMS

| Variable | N_{xn} (N=6) Group Mean | x | N_{yn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|----------------------|------------------------------|---|------------------------------|------------------|----------------|
| Number Withheld | 2.83 | | 10.00 | 9.23 | .0125* |
| % Withheld of Net | 11.83 | | 55.33 | 5.62 | .0393* |

*Significant at the .05 level (tail area probability).

TABLE 15

COMPARISON OF N_{xn} GROUPS WITH N_{yn} GROUPS ON
OTHER VARIABLES

| Variable | N_{xn} (N=6) Group Mean | x | N_{yn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|------------------|------------------------------|---|------------------------------|------------------|----------------|
| Elapsed Time | 110.33 | | 80.5 | 7.85 | .0187* |
| # Crossed Out | 6.0 | | 1.5 | 3.07 | .11 |
| % Crossed Out | 16.33 | | 8.83 | .78 | .40 |
| # of Votes Taken | 1.17 | | 1.33 | .38 | .55 |

*Significant at the .05 level (tail area probability).

TABLE 16
COMPARISON OF N_{XS} GROUPS WITH N_{Xn} GROUPS ON
PERCEIVED GROUP SATISFACTION

| Satis Variable | N_{XS} (N=36) Rank Sum | N_{Xn} (N=36) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-------------------|-----------------------------|-----------------------------|-----------------------|----------------|
| 1 Traced | 1533 | 1094 | 6.4 | .0111* |
| 2 Defend | 1352 | 1275 | .21 | .64 |
| 3 Pass | 1301 | 1327 | .03 | .86 |
| 4 Disagree | 1329 | 1298 | .03 | .85 |
| 5 Clarify | 1206 | 1421 | 1.6 | .20 |
| 6 Consider | 1225 | 1403 | 1.1 | .30 |
| 7 Opport. | 1197 | 1431 | 1.9 | .17 |
| 8 Time Eff. | 1435 | 1193 | 1.9 | .17 |
| 9 Not Dom. | 1496 | 1131 | 4.54 | .0331* |
| 10 Grp Lead. | 1436 | 1191 | 2.15 | .14 |
| 11 All Proc. | 1348 | 1279 | .16 | .69 |
| 12 Quant. | 1273 | 1354 | .23 | .63 |
| 13 Qual. | 1369 | 1258 | .41 | .52 |
| 14 Fair | 1338 | 1289 | .08 | .78 |
| 15 Yours | 1297 | 1331 | .04 | .85 |
| 16 Goals | 1346 | 1282 | .14 | .71 |

*Significant at the .05 level (two tailed)

For the consensual judgement rankings, the data reveal no significant results for the Cadre but the student judges ranking (ASR) weighted with the number of votes for the item, indicate that the groups using the sensitive question were superior. The number of votes per item was also significant in favor of the sensitive question. This indicates that N_{xs} groups gave each of their "top-seven" items a higher vote total than the N_{xn} groups (see Table 17).

Neither of the dependent variables quantity (see Table 18) nor withheld items (see Table 19) yielded any significant results. An examination of "other" variables, however, indicated that N_{xn} groups used significantly more time than the N_{xs} groups (see Table 20).

Comparison of N_{ys} with N_{yn} Groups

The author hypothesized that N_{yn} groups would perform better than N_{ys} groups because the Delbecq NGT still contains some aspects that tend to inhibit participants. Participants using a nonsensitive question would be less concerned because the question itself was less threatening.

An examination of the data on satisfaction seem to uphold that hypothesis. The groups using the nonsensitive question performed significantly better on the variables "time efficient" and "satisfied with all processes" of the remaining variables moved in the expected direction (see Table 21). No significant results were obtained from the consensual judgement data (see Table 22).

None of the variables under "quantity" (see Table 23) or "withheld items" (see Table 24) were significant. Comparing "other" variables,

TABLE 17
COMPARISON OF N_{XS} GROUPS WITH N_{XN} GROUPS ON
CONSENSUAL JUDGEMENT SCORES

| Variable | N_{XS} (N=42) Rank Sum | x | N_{XN} (N=42) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-----------------------------|-----------------------------|---|-----------------------------|-----------------------|----------------|
| Aver. Cad. Ranking (ACR) | 1741 | | 1829 | .16 | .69 |
| ACR x Points | 1742 | | 1828 | .15 | .70 |
| ACR x Votes | 1981 | | 1589 | 3.07 | .08 |
| Aver. Stu. Ranking (ASR) | 1827 | | 1743 | .14 | .71 |
| ASR x Points | 1851 | | 1718 | .35 | .55 |
| ASR x Votes | 2076 | | 1494 | 6.78 | .0092* |
| Num. Votes for Item | 2158 | | 1411 | 11.2 | .0008* |

*Significant at the .05 level (two tailed)

TABLE 18

COMPARISON OF N_{XS} GROUPS WITH N_{Xn} GROUPS ON
QUANTITY OF IDEAS GENERATED

| Variable | N_{XS} (N=6) Group Mean | x | N_{Xn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|--------------------------------|------------------------------|---|------------------------------|------------------|----------------|
| Net Quantity | 24.17 | | 29.67 | .57 | .47 |
| Total (Crossed Out and Net) | 33.0 | | 35.67 | .14 | .71 |

TABLE 19

COMPARISON OF N_{XS} GROUPS WITH N_{Xn} GROUPS ON
WITHHELD ITEMS

| Variable | N_{XS} (N=6) Group Mean | x | N_{Xn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|----------------------|------------------------------|---|------------------------------|------------------|----------------|
| Number Withheld | 3.33 | | 2.83 | .05 | .82 |
| % Withheld of Net | 20.66 | | 11.83 | .32 | .58 |

TABLE 20

COMPARISON OF N_{XS} GROUPS WITH N_{Xn} GROUPS ON
OTHER VARIABLES

| Variable | N_{XS} (N=6) Group Mean | x | N_{Xn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|------------------|------------------------------|---|------------------------------|------------------|----------------|
| Elapsed Time | 88.00 | | 110.33 | 5.32 | .0437* |
| # Crossed Out | 8.83 | | 6.0 | .41 | .53 |
| % Crossed Out | 26.8 | | 16.33 | .84 | .38 |
| # of Votes Taken | 1.5 | | 1.17 | 1.42 | .26 |

*Significant at the .05 level (tail area probability)

TABLE 21
COMPARISON OF N_{ys} GROUPS WITH N_{yn} GROUPS ON
PERCEIVED GROUP SATISFACTION

| Satis. Variable | N _{ys} (N=30) Rank Sum | N _{ys} (N=36) Rank Sum | Kruskal Test Stat. | Level Sign. |
|--------------------|------------------------------------|------------------------------------|-----------------------|----------------|
| 1 Traced | 1052 | 1158 | .38 | .54 |
| 2 Defend | 1010 | 1201 | .00 | .95 |
| 3 Pass | 1108 | 1103 | 2.38 | .12 |
| 4 Disagree | 1023 | 1187 | .06 | .80 |
| 5 Clarify | 1023 | 1187 | .06 | .80 |
| 6 Consider | 1050 | 1160 | .36 | .55 |
| 7 Opport. | 995 | 1215 | .02 | .89 |
| 8 Time Eff. | 784 | 1427 | 8.25 | .0041* |
| 9 Not Dom. | 982 | 1229 | .09 | .76 |
| 10 Grp. Lead. | 908 | 1302 | 1.74 | .18 |
| 11 All Proc. | 846 | 1364 | 4.36 | .0367* |
| 12 Quant | 1030 | 1180 | .11 | .74 |
| 13 Qual. | 978 | 1233 | .13 | .72 |
| 14 Fair | 1075 | 1135 | .87 | .35 |
| 15 Yours | 981 | 1230 | .10 | .75 |
| 16 Goals | 1060 | 1151 | .52 | .47 |

*Significant at the .05 level (two tailed)

TABLE 22
COMPARISON OF N_{ys} GROUPS WITH N_{yn} GROUPS ON
CONSENSUAL JUDGEMENT SCORES

| Variable | N_{ys} (N=42) Rank Sum | x | N_{yn} (N=42) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-----------------------------|-----------------------------|---|-----------------------------|-----------------------|----------------|
| Aver. Cad. Ranking (ACR) | 1799 | | 1771 | .02 | .90 |
| ACR x Points | 1832 | | 1738 | .17 | .67 |
| ACR x Votes | 1883 | | 1686 | .78 | .38 |
| Aver. Stu. Ranking (ASR) | 1584 | | 1986 | 3.3 | .07 |
| ASR x Points | 1661 | | 1908 | 1.2 | .27 |
| ASR x Votes | 1673 | | 1897 | 1.0 | .32 |
| Num. Votes for Item | 1834 | | 1735 | .20 | .66 |

*Significant at the .05 level (two tailed)

TABLE 23

COMPARISON OF N_{ys} GROUPS WITH N_{yn} GROUPS ON
QUANTITY OF IDEAS GENERATED

| Variable | N_{ys} (N=6) Group Mean | x | N_{yn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|--------------------------------|------------------------------|---|------------------------------|------------------|----------------|
| Net Quantity | 23.67 | | 22.00 | .20 | .66 |
| Total (Crossed Out and Net) | 29.67 | | 23.5 | 3.01 | .11 |

TABLE 24

COMPARISON OF N_{ys} GROUPS WITH N_{yn} GROUPS ON
WITHHELD ITEMS

| Variable | N_{ys} (N=6) Group Mean | x | N_{yn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|----------------------|------------------------------|---|------------------------------|------------------|----------------|
| Number Withheld | 8.25 | | 10.0 | .39 | .54 |
| % Withheld of Net | 35.75 | | 55.33 | .72 | .41 |

TABLE 25

COMPARISON OF N_{ys} GROUPS WITH N_{yn} GROUPS ON
OTHER VARIABLES

| Variable | N_{ys} (N=6) Group Mean | x | N_{yn} (N=6) Group Mean | ANOVA F Value | Level Sign. |
|------------------|------------------------------|---|------------------------------|------------------|----------------|
| Elapsed Time | 92.66 | | 80.5 | 1.99 | .19 |
| # Crossed Out | 6.0 | | 1.5 | 7.64 | .02* |
| % Crossed Out | 19.17 | | 8.83 | 2.14 | .17 |
| # of Votes Taken | 1.67 | | 1.33 | 1.25 | .29 |

*Significant at the .05 level (tail area probability).

the number of crossed out items was significantly greater for groups using the sensitive question (see Table 25) than the nonsensitive question.

Comparison of N_s with N_n Groups

It was generally expected that the nonsensitive groups would do as well or better than the sensitive groups because fewer inhibitions would be raised under the former than the latter. Data on perceived satisfaction do not lend much support to that hypothesis as the group using the sensitive question significantly outperformed the N_n groups on the "traced back" variable (see Table 26). The consensual judgement data showed no significant results but the "number of votes" for the item was significantly higher for groups using the sensitive question as opposed to the nonsensitive question (see Table 27).

No significant differences were noted in the "quantity" data (see Table 28) or in the number of "withheld items" (see Table 29). Likewise no significant results were obtained when comparing the "other" variables for N_s and N_n groups (see Table 30).

Additional Data

In addition to the data gathered on the dependent variables, some other data were collected including:

Elapsed Time--of the six between-group comparisons, only two resulted in significant differences in the amount of time used for the NGT session. (1) The N_{xn} groups used significantly more time than the N_{yn} groups and (2) the N_{xn} groups used significantly more time than the N_{xs} groups.

TABLE 26
COMPARISON OF N_s GROUPS WITH N_n GROUPS ON
PERCEIVED GROUP SATISFACTION

| Satis. Variable | N_s (N=66) Rank Sum | N_n (N=72) Rank Sum | Kruskal Test Stat. | Level Sign. |
|--------------------|--------------------------|--------------------------|-----------------------|----------------|
| 1 Traced | 5097 | 4493 | 4.87 | .0272* |
| 2 Defend | 4672 | 4919 | .14 | .70 |
| 3 Pass | 4782 | 4809 | .97 | .32 |
| 4 Disagree | 4634 | 4956 | .04 | .83 |
| 5 Clarify | 4402 | 5188 | .68 | .40 |
| 6 Consider | 4524 | 5066 | .07 | .79 |
| 7 Opport. | 4347 | 5244 | 1.12 | .29 |
| 8 Time Eff. | 4403 | 5188 | .63 | .43 |
| 9 Not Dom. | 4919 | 4671 | 2.11 | .15 |
| 10 Grp. Lead. | 4621 | 4970 | .02 | .87 |
| 11 All Proc. | 4332 | 5258 | 1.23 | .27 |
| 12 Quant. | 4603 | 4987 | .01 | .94 |
| 13 Qual. | 4644 | 4946 | .06 | .80 |
| 14 Fair | 4791 | 4799 | .79 | .37 |
| 15 Yours | 4506 | 5084 | .12 | .72 |
| 16 Goals | 4785 | 4806 | .74 | .39 |

*Significant at the .05 level (two tailed)

TABLE 27
COMPARISON OF N_S GROUPS WITH N_n GROUPS ON
CONSENSUAL JUDGEMENT SCORES

| Variable | N_S (N=84) Rank Sum | x | N_n (N=84) Rank Sum | Kruskal Test Stat. | Level Sign. |
|-----------------------------|--------------------------|---|--------------------------|-----------------------|----------------|
| Aver. Cad. Ranking (ACR) | 7034 | | 7162 | .04 | .84 |
| ACR x Points | 7111 | | 7085 | .00 | .97 |
| ACR x Votes | 7657 | | 6539 | 3.1 | .08 |
| Aver. Stu. Ranking (ASR) | 6816 | | 7380 | .81 | .37 |
| ASR x Points | 6987 | | 7209 | .12 | .72 |
| ASR x Votes | 7437 | | 6759 | 1.16 | .28 |
| Num. Votes for Item | 7905 | | 6290 | 6.6 | .0103* |

*Significant at the .05 level (two tailed)

TABLE 28

COMPARISON OF N_s GROUPS WITH N_n GROUPS ON
QUANTITY OF IDEAS GENERATED

| Variable | N_s (N=12) Group Mean | x | N_n (N=12) Group Mean | ANOVA F Value | Level Sign. |
|--------------------------------|----------------------------|---|----------------------------|------------------|----------------|
| Net Quantity | 23.92 | | 25.83 | .22 | .64 |
| Total (Crossed Out and Net) | 31.33 | | 29.58 | .17 | .68 |

TABLE 29

COMPARISON OF N_s GROUPS WITH N_n GROUPS ON
WITHHELD ITEMS

| Variable | N_s (N=10) Group Mean | x | N_n (N=12) Group Mean | ANOVA F Value | Level Sign. |
|----------------------|----------------------------|---|----------------------------|------------------|----------------|
| Number Withheld | 5.30 | | 6.4 | .26 | .61 |
| % Withheld of Net | 22.2 | | 33.6 | .68 | .41 |

TABLE 30

COMPARISON OF N_s GROUPS WITH N_n GROUPS ON
OTHER VARIABLES

| Variable | N_s (N=12) Group Mean | x | N_n (N=12) Group Mean | ANOVA F Value | Level Sign. |
|------------------|----------------------------|---|----------------------------|------------------|----------------|
| Elapsed Time | 90.33 | | 95.4 | .44 | .52 |
| # Crossed Out | 7.4 | | 3.75 | 2.38 | .14 |
| % Crossed Out | 23.0 | | 12.5 | 2.48 | .129 |
| # of Votes Taken | 1.58 | | 1.25 | 2.83 | .11 |

Number of Crossed Out Items--the number of items recorded on the flip charts and later crossed out by the group were tabulated. The data indicate that the only significant difference was between N_{ys} and the N_{yn} groups, with the N_{ys} groups crossing out significantly more items than the N_{yn} groups.

Participants Subjective Comments--each participant, as part of the satisfaction questionnaire, was asked to describe the aspects of the NGT process he/she liked most and least. For the experimental groups, the most liked aspects were the discussion phase (32), the round robin (21), the voting phase (10), and other categories (9). For the Delbecq NGT groups the most liked aspects were the discussion phase (34), those who did not answer (15), the round robin (12) and other categories (12).

The least liked aspects for the Mod NGT groups were time (25), discussion phase (12), round robin (5), and other (26). The least liked aspects for the Delbecq NGT groups were discussion phase (18), did not answer (17), time (12), round robin (6), and other categories (19).

Recorder Comments--Group recorders were asked to comment on any problems they encountered during the NGT session. Of the twenty-four groups only five recorders made written comments. Two recorders discussed problems with the tape recorders while two others noted that it was difficult to keep the members interested as the session progressed. One

recorder explained why he felt his group had crossed out so many ideas (because the ideas improved as the members became more involved).

VII. CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Conclusions

As mentioned previously, this study was designed to test the hypotheses regarding whether (1) Mod NGT groups would outperform the Delbecq NGT groups and (2) whether the relative sensitivity of the NGT question has any effect on group performance. Given the small N and the relative similarity between the NGT Mod and the Delbecq techniques, as well as the limited degree in which the two NGT questions differ on relative sensitivity, the author did not expect large statistical differences for all variables between each of the treatments. Thus even though the majority of this chapter will be devoted to variables that are statistically significant, some comments on indicators or tendencies (for nonsignificant variables) will also be included in the discussion.

Considering each of the four major dependent variables (satisfaction, consensual judgement score, quantity and withheld items) the following conclusions were reached.

Comparison of N_x with N_y Groups

It was predicted (H_1 , H_2 , H_3 , H_{10}) that the Mod NGT groups would perform better than the Delbecq NGT groups. The data indicate that the Mod NGT groups did tend to perform better. Four of the measures were statistically significant revealing the superiority of the Mod NGT

on (1) the number of "withheld items," (2) the Average Student Ranking (ASR) consensual ranking scores, (3) satisfaction that items presented could not be "traced back," and (4) satisfaction with the "quantity of items produced." This study provides no evidence to suggest that the Delbecq NGT is superior to the Mod NGT. Not one of the remaining twenty-two dependent measures supported the superiority of the Delbecq technique (control group). In fact all of the remaining dependent measures (although nonsignificant) moved in the direction of the superiority of the Mod NGT.

Mod NGT groups withheld fewer ideas thus giving support for the contention that the Mod NGT process eliminates some of the inhibitions present in the Delbecq NGT. Mod NGT groups were more satisfied with the "quantity of items produced" by the group and with the fact that an item presented to the group could not be "traced back" to its originator. The latter indicates that the Mod NGT was better able to separate the idea from the individual presenting it. The elimination of this linkage is a desirable characteristic if ideas are to be evaluated on merit, rather than on the status of the individuals presenting them. Mod NGT groups also generated items that received higher consensual judgement rankings (ASR) from the student judges than items generated by the Delbecq NGT groups received.

Comparison of N_{XS} with N_{YS} Groups

The author predicted (H_4 , H_5 , H_6) that the experimental groups using a sensitive question would outperform the control groups using a sensitive question. The data indicate that the N_{XS} groups do tend

to outperform the N_{ys} groups. Five of the dependent measures were statistically significant indicating that the N_{xs} outperformed the N_{ys} on (1) satisfaction that ideas couldn't be "traced back," (2) satisfaction that the process was "time efficient," (3) satisfaction with the "quantity" of ideas generated by the group, (4) the ASR student consensual judgement ranking, and (5) the ASR ranking weighted by the votes cast for the item by the group. None of the dependent measures were significant in the opposite direction, meaning that in no case did the N_{ys} groups give significantly better results than the N_{xs} groups. In fact, twenty of the remaining twenty-one dependent measures (all nonsignificant) tended toward the direction of supporting the N_{xs} groups as being superior.

Comparison of N_{xn} with N_{yn} Groups

It was predicted (H_7 , H_8 , H_9) that the N_{xn} groups would outperform the N_{yn} groups even on this less sensitive question. The evidence indicates that the N_{xn} groups did significantly outperform the N_{ys} groups on four variables: (1) the total quantity of ideas produced; (2) satisfaction with the quantity of ideas generated; (3) the number of items withheld from the group; and (4) the percent of items that were withheld.

This indicates that the N_{xn} groups generated more items, were more satisfied with the number they produced and withheld fewer items than did the N_{yn} groups. In no case did the N_{yn} groups give significantly better results than the N_{xn} groups.

Comparison of N_{xs} with N_{xn} Groups

It was suggested that there would be no significant differences (in performance) between the two groups. This would be due to the fact that the Mod NGT technique should eliminate any inhibiting factors caused by a sensitive question, thus making the groups essentially equal. The data, however, indicate that the groups are not equal and that the N_{xs} groups significantly outperform the N_{xn} groups on three variables--(1) satisfaction that an idea would not be "traced back," (2) satisfaction that the group was "not dominated" by anyone, and (3) the student (ASR) consensual judgement ranking weighted by the votes given each item by the group. The tendency for N_{xs} groups to outperform N_{xn} groups could be a result of the fact that sensitive questions can be stimulating as well as inhibiting. Thus with the Mod NGT neutralizing the inhibiting factors the end result could be a slight tendency towards being more productive. In no case did the N_{xn} groups significantly outperform the N_{xs} groups.

Comparison of N_{ys} with N_{yn} Groups

Because sensitive questions can be inhibiting, it was suggested that the Delbecq NGT, with its inhibiting aspects, would be less effective on sensitive questions than on nonsensitive ones. The analysis of the data produced evidence that the N_{yn} groups did significantly outperform the N_{ys} groups on two dependent measures: (1) satisfaction with all aspects of the process; and (2) satisfaction that the process was time efficient. Both of these variables indicated that the groups with the nonsensitive question outperformed the groups with a sensitive question as predicted. In no case did the N_{ys} groups significantly

outperform the N_{yn} groups. This tendency for N_{yn} groups to outperform N_{ys} groups could be an indicator that inhibitors (raised by a sensitive question) are not being adequately reduced by the Delbecq technique.

As a result, groups without inhibitions (those using nonsensitive questions) outperform those with inhibiting factors (those using sensitive questions).

Comparison of N_s with N_n Groups

It was suggested that groups using a nonsensitive question would outperform the groups using sensitive questions. The data, however, indicate that the N_s groups significantly outperformed the N_n groups on the satisfaction variable "traced back." In no case did the N_n groups significantly outperform the N_s groups.

Overall Conclusions

Of the seventy-eight dependent measures used to compare the Mod NGT groups with the Delbecq NGT groups, thirteen (1 out of 6) were significant at the .05 level. All thirteen significant measures supported the hypothesis that the Mod NGT outperformed the Delbecq NGT. In no case did the Delbecq NGT significantly outperform the Mod NGT.

The Mod NGT groups outperformed the Delbecq NGT groups regardless of whether a sensitive or a nonsensitive question was used. The Mod NGT performed better (against itself, N_{xs} vs. N_{xn}) using a sensitive NGT question, rather than a nonsensitive question. On the other hand, the Delbecq NGT performed better (against itself, N_{ys} vs. N_{yn}) using a nonsensitive NGT question, rather than a sensitive one.

Suggestions for Future Research

To provide meaningful results from experiments that simulate real world processes, consideration should be given toward using existing as opposed to ad hoc decision groups. Studying the longitudinal benefits of the Mod NGT might also add vital information to the literature on small group decision making. Consideration should also be given to comparing the Mod NGT with conventional interacting groups. Although there are numerous studies cited in Chapter II demonstrating the relative superiority of the NGT, their failure to adhere to the NGT procedures makes one question if close adherence to procedures might not provide even more dramatic results.

Another major consideration for any future research is the relative value of the quality or consensual judgement rating. Cooley (1977) devotes an entire chapter to the problem of an accurate quality rating without resolving the issue. The consensual judgement ranking by the Cadre failed to be significant in any of the eighteen possible comparisons while the student ratings proved significant four times. This could be an indication of a poor agreement on relevant issues between the Cadre and the total body of ROTC students that participated in this study. So, even though they have more experience and knowledge of realistic solutions, it appears that their value as raters for this particular ROTC unit must be questioned. The only plausible explanation is that the lack of variance (no significant high or low groups) is due to the fact that their high and low rated items were the average items for the cadets in the NGT sessions, and vice versa. Although this quality rating problem is not new, it follows that, for this ROTC unit, peer ratings may be the only acceptable

alternative (rather than dropping the quality measure altogether) when such a larger number of items (168) must be rated. In addition an alternative to alternation ranking (2-4 hours) or paired comparisons must be developed to ensure accurate ratings of large quantities of ideas.

APPENDIX A
NOMINAL GROUP TECHNIQUE

Delbecq et al. (1975)

Summary Leadership Guide for Conducting an NGT Meeting.

Preparing the Meeting Room

Table Arrangement:

- Tables arranged as an open "U" with a flip chart at the open end of the table
- Sufficient space between tables to avoid interference

Supplies:

- Flip chart for each table and for the leader
- Roll of masking tape
- Nominal worksheet and pencils for each participant
- 3 x 5 cards (for ranking); voting forms (for rating)
- Felt pens

Introducing the Meeting

Welcome Statement:

- Cordial and warm welcome
- Statement of the importance of the NGT task
- Clarification of the importance of each group member's contribution
- Statement of the use or purpose of the meeting's output

Conducting the Nominal Group Process

STEP 1. SILENT GENERATION OF IDEAS IN WRITING

Process:

- Present the nominal question to the group in writing
- Verbally read the question
- Illustrate level of abstraction and scope desired with example which does not distort (lead) group responses
- Avoid other requests for clarification
- Charge the group to write ideas in brief phrases or statements
- Ask group members to work silently and independently
- Model good group behavior
- Sanction disruption of the silent, independent activity by comments addressed to group as a whole.

Benefits:

- Provides adequate time for thinking
- Facilitates hard work by the model of other group members reflecting and writing
- Avoids interrupting each other's thinking
- Avoids premature focusing on single ideas

Delbecq et al. (1975)
NGT (cont.)

- Eliminates dominance by high-status or aggressive members in idea generation
- Keeps the group problem-centered

STEP 2. ROUND-ROBIN RECORDING OF IDEAS ON A FLIP PAD

Process:

- Provide clear instructions concerning the step:

- Indicate objective of the step is to map the group's thinking
 - Explain need to present ideas in brief words or phrases
 - Explain process of taking one idea serially from each member
 - Explain group members must decide if items are duplicates
 - Explain that an individual may "pass" when he has no further items, but may "reenter" later
 - Express the desirability of hitchhiking and adding new ideas even if they are not on individual nominal worksheets
 - Explain inappropriateness of discussion prior to completion of listing

- Quick effective mechanical recording:

- Record ideas as rapidly as possible
 - Record ideas in the words used by group members
 - Provide assistance in abbreviating only in special situations
 - Make the entire list visible by tearing off completed sheets and taping them on an area visible to all group members

- Sanction group as a whole if individuals engage in side conversations or attempt to discuss items prior to completing the listing

Benefits:

- Equalizes opportunity to present ideas
- Assists in separating ideas from personalities
- Provides a written record and guide:
 - Increases group's ability to deal with a larger number of ideas
 - Avoids loss of ideas
 - Confronts the group with an array of clues
 - Encourages hitchhiking
- Places conflicting ideas comfortably in front of group
- Forces the group to fully explore the problem.

STEP 3. SERIAL DISCUSSION FOR CLARIFICATION

Process:

- Verbally define the meaning of items
 - To clarify the meaning of items
 - To explain reasons for agreement or disagreement
- Indicate the final judgments will be expressed by voting so arguments are unnecessary
- Pace the group so that all ideas receive sufficient time for clarification
- Avoid forcing the member who originally lists the idea to be solely responsible for clarifying the item

Delbecq et al. (1975)
NGT (cont.)

Benefits:

- Avoids having discussion focus unduly on any particular idea or subset of ideas
- Helps eliminate misunderstanding
- Provides opportunity to express the logic behind items
- Allows members to disagree without undue argumentation

STEP 4. PRELIMINARY VOTE ON ITEM IMPORTANCE

Process:

- Ask the group to select from the entire list a specific number (7 ± 2) of priority (important) items:
- Place each priority item on a 3 x 5 card or rating form
- Rank-order or rate the selected priority items
- Collect the cards or rating forms and shuffle them to retain anonymity
- Tally the vote and record the results on the flip chart in front of the group

Benefits:

- Obtaining independent judgments in writing helps eliminate social pressures
- Expressing judgments mathematically by ranking-ordering or rating increases accuracy of judgments
- Displaying the array of individual votes clearly highlights areas needing further clarification or discussion

STEP 5. DISCUSSION OF THE PRELIMINARY VOTE

Process:

- Define the role of the step as clarification, not pressure toward artificial consensus
- Keep the discussion brief
- Caution group members to think carefully about any changes they make in their voting

Benefits:

- Provide group members a final opportunity to clarify their positions
- Ensures that "spread" votes really reflect differences in judgment, not unequal information or misunderstanding

STEP 6. FINAL VOTE

Process:

- (Repeat Step 4.)

Benefits:

- Accurate aggregation of group judgments and error reduction
- Closure to the meeting

Taken from: Group Techniques for Program Planning, Andre L. Delbecq, Andrew H. Van de Ven and David H. Gustafson. Glenview, Illinois: Scott, Foresman and Co., 1975.

APPENDIX B

MOD NGT--INSTRUCTIONS TO GROUP LEADERS

Please read these instructions carefully. If you have any questions, ask one of the assistants to help you.

Your Function

Your job as group leader is to ensure that the procedures (as outlined below) for the Nominal Group Process are strictly adhered to.

Some Do's and Don'tsDon't

- contribute your own ideas or solutions
- criticize ideas
- allow arguments
- ask the initiator of an idea to explain it
- suggest compromises
- reword ideas for members

Do

- try to keep the process from bogging down
- write swiftly but legibly on the flip chart pages
- tally the votes swiftly
- avoid long explanations of the Nominal Group Process
- try to stop any side conversations between members
- ask for assistance if you have any questions

Procedures for a Group LeaderSet Up

- A. You will be randomly assigned 6 participants. If you do not have six, ask for assistance.
- B. You will be assigned a table either in the mess hall or in the rec. hall (to the east of the mess hall towards the river). Participants should sit in a "U" shape (three to a side) with you at the head of the table with the large recording sheets.
- C. Plug in the tape recorder (if assigned) make sure it works and that it is as inconspicuous as possible.

- D. Hand out from your packet to each participant
 - 1 pencil
 - 1 sheet with the topic question typed on it
 - 2 individual voting sheets
 - 10 3 x 5 cards

INTRODUCTION AND WELCOME

- A. Purpose--In friendly terms explain that: "You are participating in a dual purpose exercise. The first is to provide the AROTC with honest feedback from its cadets on the topic area listed on the sheet you were just handed. The army is looking for creative but practical solutions to this problem. The second purpose of this exercise is to acquaint you with a useful leadership tool for group decision making--the Nominal Group Technique. As a future leader you may find that this technique might have applications in many facets of army life."
- B. Importance of the task--Remind your participants that:
 - the army is sincerely interested in their responses
 - every group member is encouraged to make as large a contribution to the group as possible
 - No individual will be identified in any way. They are not to sign any form or in any way identify themselves with this group. Because they are anonymous participants, they are encouraged to be as candid and honest as possible.
 - When presenting possible solutions, each member is asked to be creative but also practical considering the monetary and personnel constraints facing AROTC. The ideas generated will be used solely by the local AROTC cadre.
- C. Describe the Process--Briefly (one minute maximum) tell the participants there will be six steps in the Nominal Group Process:
 1. The Silent Writing of ideas by each individual
 2. The Listing of these ideas--one at a time
 3. The Brief Discussion of each item
 4. The Voting--secret ballot to select the Top "7" most important items
 5. Discussion of the Vote (optional with each group)
 6. Re-Vote (optional with each group)

Do not discuss the process in detail--explain that each step will be described as it occurs.

Try to avoid answering questions about the process at this time.
- D. Other Items
 - urge the group to avoid looking or listening to other groups near by
 - ask them to remain quiet when they are not presenting an idea or making a point

NGT PROCESS

Step I Silent Generation of Ideas in Writing

- note the starting time somewhere on your summary voting sheet
- start the tape recorder (if assigned)
- verbally read the Nominal Group question to the group
- remind them you want creative but practical and useful solutions
- ask them to put their ideas in brief phrases--not long sentences
- wherever possible, ideas should be worded so that an AROTC officer could understand their meaning

Silent Writing (10 minutes)

- ask them to reread the nominal question and silently and independently write each idea on a separate 3 x 5 card (additional 3 x 5 cards are available from the assistants)
- give them ten minutes to write their ideas
- if anyone talks, sanction the activity by addressing comments to the group as a whole, not to any individual
- at the conclusion of the ten minute period, announce the time is up--but they can (and should) continue to add any new ideas at any time.

Step II Round Robin Recording of Ideas on a Flip Pad

- as a group leader you must be very careful to avoid any discussion or clarification of items during this phase
- explain to the group that the purpose of this phase is to map the group's thinking.
- explain that the ideas will be presented (one at a time) by each group member. Each member will place a single 3 x 5 card with an idea on it in the "hat" each round.
- as the group leader you will shuffle the cards and pick one to record. Read it aloud and write it on the flip chart. Then read the next card, etc., until all of the six ideas in the hat have been read.
- explain that anyone can "pass" (decline to present an idea) by merely placing a blank 3 x 5 card in the "hat" for that round. Also explain that they can re-enter at any time.
- explain that it is highly desirable to "hitchhike" on other ideas and present them during the next pass of the hat.
- as a group leader if you receive a card with an idea that is unclear or too long you must read the idea aloud and suggest that someone in the group should resubmit it in a clearer form during another round.
- explain that each individual must decide if one of their ideas is a duplicate of one already presented. However, if there is some doubt, it is usually best to present it.

- remember as group leader
 - a. you must number each item
 - b. do not reword any item
 - c. do not allow any discussion or clarification of items in this phase
 - d. sanction any unnecessary talking
 - e. write fast and legibly on the flip chart pages
 - f. ask an assistant if you run out of flip chart sheets
- remind the participants to use brief phrases, also note that although writing ideas on the flip charts will take some time, they should remember that this extra time will help to "gel" ideas they might have in their minds.

Begin the Round Robin Recording

- continue to pass the "hat" until at least two rounds in which all the 3 x 5 cards are blank.

Step III Serial Discussion for Clarification

(You might check on the tape recorder at this time)

- explain to the group that the purpose of this phase is to:
 - a. get any unclear items clarified
 - b. define the meaning of items
 - c. present positive or negative evaluative comments
- explain that final judgments will be made by voting, so arguments between members is unnecessary
- duplicates--note that it is not the goal of the group to combine or eliminate items. If however the group feels that items should be eliminated or combined, an individual must make a proposal outlining the change. If any one member objects, then the proposal fails. Objections do not have to be explained.
- Remember
 - a. pace the group--don't spend too much time (more than 2-3 minutes as a general rule) on any one item.
 - b. don't allow arguments.
 - c. feel free to skip over an item if no one volunteers any comments on it.
 - d. be careful not to force any member to defend or clarify any idea he or she may have presented in Phase II.
- tell the participants they will be asked to vote on the top "7" items in the next phase so they may want to note any items they consider valuable during the discussion phase.
- remind participants new items can still be added at any time to the list.
- begin the discussion starting with item #1.

Step IV Preliminary Vote on Item Importance

Purpose--Explain that the group will now secretly vote on the top seven items from the entire list.

- ask the participants to use one of the voting sheets they were given
- remind them to assign 7 points to the most important item, 6 to the next most important, etc.
- ask them to reread the question and then record their top "7" items using the number assigned to it on the flip chart.
- voting is confidential. After a member has voted he should fold his sheet in half and remain quiet.
- collect the folded voting sheets, shuffle them and tabulate the votes on the group leaders summary voting sheet. Do this on your own, but as quickly as possible.
- announce the Top "7" items, circle them on the flip chart pages and write the number of votes they received next to them (on the flip chart pages)

Step V Discussion of the Vote (Optional)

If there are any "ties" on the vote, there must be a revote on the tied items only. However, the group can (at its option) decide more discussion is needed on any one or several of the items. If this option is chosen, the discussion is for clarification and evaluative comments only.

Step VI Final Vote (Optional)

- if a final vote is desired, the second individual voting sheet is used. The procedures outlined in Step IV are then repeated.
- if a final vote is necessary only to break a tie then each individual assigns one point to the preferred item and 0 points to the least preferred item (a 2-1-0 system is used for 3 way ties). The back of a voting sheet can be used to vote on "ties".
- notify the group of the results of the final vote.

END OF REGULAR SESSION

- Note the time, and mark it and the total elapsed time on the final voting sheet.
- Turn off the tape recorder.

Additional Information

- remind the participants that the top "7" items will be presented to the AROTC Cadre whom might not understand your exact meaning. If the group chooses, it can add a short explanation

of any item (not to exceed a short paragraph). If the group so chooses, add that explanation (citing the item number) to your group leaders summary voting sheet (page 2).

Satisfaction Questionnaire

- give each participant one questionnaire. Ask him to read it carefully and answer each question.
- when he has completed his questionnaire, ask him to turn it over and wait for the others to finish. (Then collect the questionnaires)

Final Steps

- ask each participant to hand in all of his remaining 3 x 5 cards (whether they have ideas on them or not). You should shuffle these, remove any cards with any ideas on them and put them in a stack with a rubber band around them. Label the stack "unpresented ideas".
- collect the pencils and any remaining items from the participants.
- thank them for their assistance and ask them to get up quietly and leave the area, so that the other groups may finish.

FINAL TASKS FOR THE GROUP LEADER

- be sure to note the elapsed time on the second page of the summary voting sheet.
- write the top seven items on the summary voting sheet (page 2) and any explanatory comments the group chose to add. Remember to write the items out completely, not just the item number.
- make a note on the summary voting sheet of the total number of items generated by the group (total number--less any eliminated items).
- if you have any final comments or anything went wrong during the session explain that on the summary voting sheet also.
- take the cassette (tape) out of the recorder and put it in the group leaders envelope.
- put all pencils, markers, voting sheets, etc. in the group leaders envelope.
- unplug the tape recorder and turn it and the group leaders envelope into one of the assistants.
- pat yourself on the back for a job well done and add a thank you from AROTC and the Management Department

APPENDIX C

DELBECQ NGT--INSTRUCTIONS TO GROUP LEADERS

Please read these instructions carefully. If you have any questions, ask one of the assistants to help you.

Your Function

Your job as group leader is to ensure that the procedures (as outlined below) for the Nominal Group Process are strictly adhered to.

Some Do's and Don'ts

Don't

- contribute your own ideas or solutions
- criticize ideas
- allow arguments
- ask the initiator of an idea to explain it
- suggest compromises
- reword ideas for members

Do

- try to keep the process from bogging down
- write swiftly but legibly on the flip chart pages
- tally the votes swiftly
- avoid long explanations of the Nominal Group Process
- try to stop any side conversations between members
- ask for assistance if you have any questions

Procedures for a Group Leader

Set Up

- A. You will be randomly assigned 6 participants. If you do not have six, ask for assistance.
- B. You will be assigned a table either in the mess hall or in the rec. hall (to the east of the mess hall towards the river). Participants should sit in a "U" shape (three to a side) with you at the head of the table with the large recording sheets.
- C. Plug in the tape recorder (if assigned) make sure it works and that it is as inconspicuous as possible.

- D. Hand out from your packet to each participant
 - 1 pencil
 - 1 sheet with the topic question typed on it
 - 2 individual voting sheets

INTRODUCTION AND WELCOME

- A. Purpose--In friendly terms explain that: "You are participating in a dual purpose exercise. The first is to provide the AROTC with honest feedback from its cadets on the topic area listed on the sheet you were just handed. The army is looking for creative but practical solutions to this problem. The second purpose of this exercise is to acquaint you with a useful leadership tool for group decision making--the Nominal Group Technique. As a future leader you may find that this technique might have applications in many facets of army life."
- B. Importance of the task--Remind your participants that:
 - the army is sincerely interested in their responses
 - every member is encouraged to make as large a contribution to the group as possible.
 - No individual will be identified in any way. They are not to sign any form or in any way identify themselves with this group. Because they are anonymous participants, they are encouraged to be as candid and honest as possible.
 - When presenting possible solutions, each member is asked to be creative but also practical considering the monetary and personnel constraints facing AROTC. The ideas generated will be used solely by the local AROTC cadre.
- C. Describe the Process--Briefly (one minute maximum) tell the participants there will be six steps in the Nominal Group Process:
 1. The Silent Writing of ideas by each individual.
 2. The Listing of these ideas--one at a time.
 3. The Brief Discussion of each item.
 4. The Voting--secret ballot to select the Top "7" most important items.
 5. Discussion of the Vote (optional with each group).
 6. Re-Vote (optional with each group).
- D. Other Items
 - urge the group to avoid looking or listening to other groups near by.
 - ask them to remain quiet when they are not presenting an idea or making a point.

NGT PROCESS

Step I Silent Generation of Ideas in Writing

- note the starting time somewhere on your summary voting sheet
- start the tape recorder (if assigned)
- verbally read the Nominal Group question to the group
- remind them you want creative but practical and useful solutions
- ask them to put their ideas in brief phrases--not long sentences
- wherever possible, ideas should be worded so that an AROTC officer could understand their meaning

Silent Writing (10 minutes)

- ask them to reread the nominal question and silently and independently write their ideas down in any order on the nominal question sheet
- give them ten minutes to write their ideas
- if anyone talks, sanction the activity by addressing comments to the group as a whole, not to any individual
- at the conclusion of the ten minute period, announce the time is up--but they can (and should) continue to add any new ideas at any time.

Step II Round Robin Recording of Ideas on a Flip Pad

- as a group leader you must be very careful to avoid any discussion or clarification of items during this phase.
- explain to the group that the purpose of this phase is to map the group's thinking.
- explain that ideas will be presented (one at a time) by each group member in a round robin fashion. After each member has presented an idea, the round robin starts again.
- explain that any one can "pass" (decline to present an idea) by merely raising his/her hand if he/she has no further items to present at that time. Also explain that they can re-enter at any time.
- explain that it is highly desirable to "hitchhike" on other ideas and present them during your turn.
- explain that each individual must decide if one of their ideas is a duplicate of one already presented. However, if there is some doubt it is usually best to present it.
- remember as group leader
 - a. you must number each item
 - b. do not reword any item
 - c. do not allow any discussion or clarification of items in this phase
 - d. sanction any unnecessary talking
 - e. write fast and legibly on the flip chart pages
 - f. ask an assistant if you run out of flip chart sheets

--remind the participants to use brief phrases, also note that although writing ideas on the flip charts will take some time, they should remember that this extra time will help to "gel" ideas they might have in their minds.

Begin the Round Robin Recording

--continue recording until everyone "passes" on the same round

Step III Serial Discussion for Clarification

(You might check on the tape recorder at this time)

- explain to the group that the purpose of this phase is to:
 - a. get any unclear items clarified
 - b. define the meaning of items
 - c. present positive or negative evaluative comments
- explain that final judgments will be made by voting, so arguments between members is unnecessary
- duplicates--note that it is not the goal of the group to combine or eliminate items. If, however, the group feels that items should be eliminated or combined, an individual must make a proposal outlining the change. If any one member objects, then the proposal fails. Objections do not have to be explained.
- Remember
 - a. pace the group--don't spend too much time (more than 2-3 minutes as a general rule) on any one item.
 - b. don't allow arguments.
 - c. feel free to skip over an item if no one volunteers any comments on it.
 - d. be careful not to force any member to defend or clarify any idea he or she may have presented in Phase II.
- tell the participants they will be asked to vote on the top "7" items in the next phase so they may want to note any items they consider valuable during the discussion phase.
- remind the participants new items can still be added at any time to the list.
- begin the discussion starting with item #1.

Step IV Preliminary Vote on Item Importance

Purpose--Explain that the group will now secretly vote on the top seven items from the entire list.

- ask the participants to use one of the voting sheets they were given
- remind them to assign 7 points to the most important item, 6 to the next most important, etc.
- ask them to reread the question and then record their top "7" items using the number assigned to it on the flip chart.
- voting is confidential. After a member has voted he should fold his sheet in half and remain quiet.

- collect the folded voting sheets, shuffle them and tabulate the votes on the group leaders summary voting sheet. Do this on your own, but as quickly as possible.
- announce the Top "7" items, circle them on the flip chart pages and write the number of votes they received next to them (on the flip chart pages)

Step V Discussion of the Vote (Optional)

If there are any "ties" on the vote, there must be a revote on the tied items only. However, the group can (at its option) decide more discussion is needed on any one or several of the items. If this option is chosen, the discussion is for clarification and evaluative comments only.

Step VI Final Vote (Optional)

- if a final vote is desired, the second individual voting sheet is used. The procedures outlined in Step IV are then repeated.
- if a final vote is necessary only to break a tie then each individual assigns one point to the preferred item and 0 points to the least preferred item (a 2-1-0 system is used for 3 way ties). The back of a voting sheet can be used to vote on "ties".
- notify the group of the results of the final vote.

END OF REGULAR SESSION

- Note the time, and mark it and the total elapsed time on the final voting sheet.
- Turn off the tape recorder.

Additional Information

- remind the participants that the top "7" items will be presented to the AROTC Cadre whom might not understand your exact meaning. If the group chooses, it can add a short explanation of any item (not to exceed a short paragraph). If the group so chooses, add that explanation (citing the item number) to your group leaders summary voting sheet (page 2).

Satisfaction Questionnaire

- give each participant one questionnaire. Ask him to read it carefully and answer each question.
- when he has completed his questionnaire, ask him to turn it over and wait for the others to finish. (Then collect the questionnaires)

Final Steps

- ask each participant to hand in his/her sheet with the Nominal Question on it as well as the items he/she presented to the group. Shuffle the sheets. These sheets will remain with the project leader and they will never be seen by the AROTC
- collect the pencils and any remaining items from the participants.
- thank them for their assistance and ask them to get up quietly and leave the area, so that the other groups may finish.

FINAL TASKS FOR THE GROUP LEADER

- be sure to note the elapsed time on the second page of the summary voting sheet.
- write the top seven items on the summary voting sheet (page 2) and any explanatory comments the group chose to add. Remember to write the items out completely, not just the item number.
- make a note on the summary voting sheet of the total number of items generated by the group (total number--less any eliminated items).
- if you have any final comments or anything went wrong during the session explain that on the summary voting sheet also.
- take the cassette (tape) out of the recorder and put it in the group leaders envelope.
- put all pencils, markers, voting sheets, etc. in the group leaders envelope.
- unplug the tape recorder and turn it and the group leaders envelope into one of the assistants.
- pat yourself on the back for a job well done and add a thank you from AROTC and the Management Department.

APPENDIX D

PARTICIPANT SATISFACTION QUESTIONNAIRE

The following questionnaire is designed to assist us in understanding how satisfied you are with the Nominal Group meeting you just completed.

--Please take your time and answer as accurately as possible.

--Please answer every question.

--Please circle the appropriate number for each question

(Example: Totally Unsatisfied /0/1/2/3/4/5/6/7/8/9/10/ Totally Satisfied)
Indif.

Part I. GROUP PROCESS - Satisfaction with different aspects of the Nominal Group Process

1. How satisfied are you that the ideas presented to the group could not be "traced" back to the individuals who presented them?

Totally Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

2. How satisfied are you that you were free to refuse to defend or clarify ideas you submitted to the group?

Totally Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

3. How satisfied are you that you were free to "pass" without embarrassment during the Round Robin presentation of ideas?

Totally Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

4. How satisfied are you that you were free to challenge or disagree with an item during the discussion phase?

Totally Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

5. How satisfied are you that you were free to ask questions and seek clarification of items during the discussion phase?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

6. How satisfied are you that the ideas you presented to the group were given fair consideration by the group?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

7. How satisfied are you with the opportunities you had to present your ideas to the group?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

8. How satisfied are you that the group process was time efficient?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

9. How satisfied are you that the group process was not dominated by any one individual or small group?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

10. How satisfied are you with the performance of the group leader?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

11. Overall, how satisfied are you with all of the procedural aspects of the nominal group process?

Totally
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Totally Satisfied
Indifferent

Part II GROUP OUTPUT - Satisfaction with the final output of the group

12. How satisfied are you with the quantity (number of items) generated by the group?

Totally Satisfied
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Indifferent

13. How satisfied are you with the quality of the items generated by the group?

Totally Satisfied
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Indifferent

14. How satisfied are you that the items generated by your group are a fair representation of the group's feeling?

Totally Satisfied
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Indifferent

15. How satisfied are you with the prospect of presenting the group's output as your position?

Totally Satisfied
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Indifferent

16. How satisfied are you that the group attained its over-all goals?

Totally Satisfied
Unsatisfied / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / Indifferent

Part III SHORT ANSWER QUESTIONS

17. What aspects of the process did you like the most?

18. What aspects of the process did you like the least?

19. Do you have any suggestions for the improvement of the process?

20. Do you have any general comments about the process, the recorder or the experiment?

Part IV

Have you ever participated in a decision meeting or conference that used a process other than the Nominal Group Technique you just completed? If so, please compare this "other" process with the Nominal Group Technique. (Circle one for each question)

21. Comparing Group Leaders, in the "other" process the leader was
- | | | | | |
|-------------------------|--------------------|---------------------|----------------------|---------------------------|
| 1 Much More Dominant | 2 More Dominant | 3 About the Same | 4 More Submissive | 5 Much More Submissive |
|-------------------------|--------------------|---------------------|----------------------|---------------------------|
22. Comparing the amount of discussion, in the "other" process there was
- | | | | | |
|---------------------------|----------------------|---------------------|----------------------|---------------------------|
| 1 Much More Discussion | 2 More Discussion | 3 About the Same | 4 Less Discussion | 5 Much Less Discussion |
|---------------------------|----------------------|---------------------|----------------------|---------------------------|
23. Comparing the amount of arguing, in the "other" process there was
- | | | | | |
|-------------|--------|---------------------|--------|-------------|
| 1 Much More | 2 More | 3 About the Same | 4 Less | 5 Much Less |
|-------------|--------|---------------------|--------|-------------|
24. Comparing how a solution was chosen, in the "other" process the solution was generally selected by
- | | | | |
|---------------------|--------------------|--------------------------|---|
| 1 Unanimous Vote | 2 Majority Vote | 3 By the Group Leader | 4 Generally no agreement was reached |
|---------------------|--------------------|--------------------------|---|
25. Comparing how free you felt to express ideas, in the "other" process you felt
- | | | | | |
|---------------------|----------------|---------------------|----------------|---------------------|
| 1 Much More Free | 2 More Free | 3 About the Same | 4 Less Free | 5 Much Less Free |
|---------------------|----------------|---------------------|----------------|---------------------|
26. In general, did you find the Nominal Group Process more effective or satisfying than these "other" processes you participated in?
- | | |
|-------|------|
| 1 Yes | 2 No |
|-------|------|

WHEN YOU COMPLETE THIS FORM, PLEASE REMAIN QUIET UNTIL THE GROUP LEADER COLLECTS THE FORMS.

10/24/78

APPENDIX E

INSTRUCTIONS FOR CONSENSUAL JUDGEMENT RATERS

Please read Question "A" carefully--(you may reread it as many times as necessary during this session).

Your job is to evaluate the relative quality of the responses made by the AROTC cadets to the question you have just read.

You should first find a quiet place with a large table so that you can spread the cards out easily.

- Step 1 Scan through all the "A" cards quickly to get an idea of what ideas have been generated.
- Step 2 From the cards pick the ones you consider to be obvious duplicates and paper clip them together.

CRITERIA FOR SCORING

You are now to begin the actual "quality" or subjective rating of items.

You are to rank items which (in your opinion) are the highest and lowest quality solutions or responses to Question "A". Your score for each item should reflect the quality of that item based on its feasibility, importance and/or merit.

- Very Highest - Step 3 Select the items which (in your opinion) are the very highest quality responses. Group them in a stack. This stack may contain only one or several items. Your only criteria for inclusion is that they are generally all of the same average quality and thus belong together (even if they cover different topics). You do not have to rate the items within this stack of cards.
- Very Lowest - Step 4 Next, select the items which (in your opinion) are the very lowest quality responses to this question. Group them together in a stack using the same criteria of similar average quality. This stack may contain a larger or smaller number of cards than the previous stack.
- 2nd Highest - Step 4 From the remaining cards select the items which you consider the next highest in over all quality as you did in Step 4.

- 2nd Lowest - Step 6 From the remaining cards select the items (card) which you consider the next lowest in over-all quality.
- Step 7 Continue selecting the next highest quality items/then the next lowest quality until you feel all the remaining cards are of the same quality.
- Step 8 You may (if you wish) reconsider moving any item to another stack of higher or lower quality.
- Step 9 Now on the "A" Rating Sheet (provided) note the number of stacks you ended up with.
- Step 10 Write the number of each of the items in the Very Highest Quality group (stack) on the 1st line of the "A" Rating Sheet (the number of the item is in red; also, the order in which you list the items within the group is not important).
- Step 11 Write the number of each of the items in the Very Lowest Quality stack on the bottom line on the Rating Sheet.
- Step 12 Continue listing the items by group (Highest/Lowest) until you only have one stack left. Place the number of each item in that last stack on the middle line of the "A" Rating Sheet.
- You are now finished with Question A - remove all clips, shuffle the cards briefly and put a rubber band around all of the "A" cards and the Question "A" card.
- Step 13 Read Question "B". Take the "B" cards and briefly scan through them.
- Step 14 Now repeat Steps 2 through 12 using the "B" cards, Question "B" and the "B" Rating Sheet.

When you finish completing the "B" Rating Sheet, reshuffle and rubber band the "B" cards and sign both rating sheets.

Return all the cards and the two sheets ("A" and "B") to Captain Knowlton.

Thank you very much for your assistance.

John Sullivan
Department of Management

RATING SHEET _____

NUMBER OF STACKS OF CARDS _____

Groups of Items
Considered to be
of the Very
Highest Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

2nd Highest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

3rd Highest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Next Highest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Next Highest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Next Highest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Middle Group
Average Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Next Lowest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Next Lowest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Next Lowest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

3rd Lowest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

2nd Lowest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

Very Lowest
Quality

Item # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___ # ___

 NAME

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BIOGRAPHICAL SKETCH

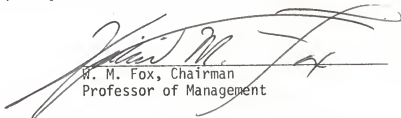
John J. Sullivan was born October 24, 1947, in Atlantic City, New Jersey. He received the Bachelor of Science degree with a major in Management in 1969 from the University of Florida.

In 1970, Mr. Sullivan received a Master of Business Administration (MBA) with a major in Management from the University of Florida.

In 1972, he accepted the position of Grants Coordinator for the University of Florida. In 1977, he re-entered the Management doctoral program full-time at the University of Florida. His areas of interest include organizational behavior, organizational development and labor relations.


Mr. Sullivan is married to Janet Sullivan.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.




W. M. Fox, Chairman
Professor of Management

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R. A. Elnicki
Associate Professor of Management

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



R. C. Ziller,
Professor of Psychology

This dissertation was submitted to the Graduate Faculty of the Department of Management in the College of Business Administration and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Dean, Graduate School